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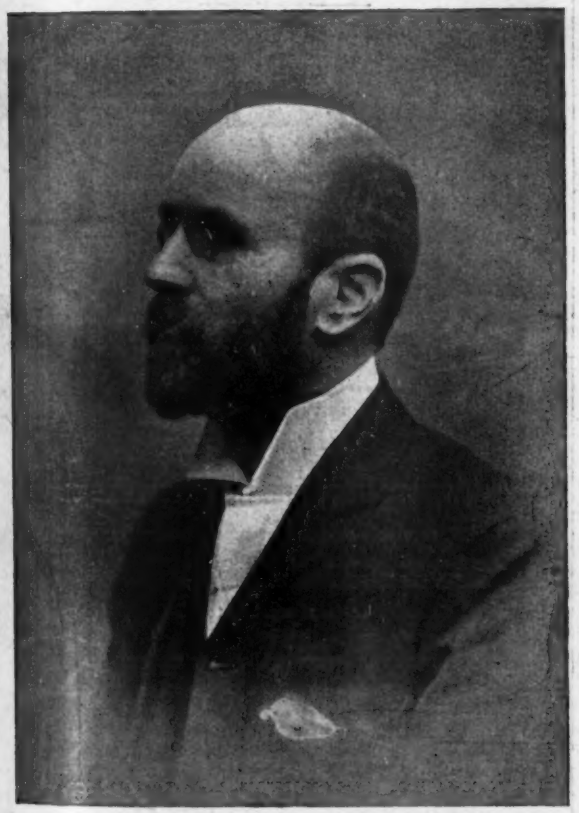

THE BRISTOL CONFERENCE:
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CONTENTS

OF THE

MARCH NUMBER.

EDUCATION IN PARLIAMENT—FEBRUARY 439
BY MANY HANDS 440
WITH OUR CHILDREN 442
NOTES FROM THE NORTH 443
IN MEMORIAM: MR. CHARLES MANSFORD, B.A. 444
NOTES AND JOTTINGS 445
THE COMING CONFERENCE OF THE N.U.T. AT BRISTOL—
THE PRESIDENT-ELECT 446
CANDIDATES FOR VICE-PRESIDENCY 447
THE CONFERENCE TOWN 449
OBJECT LESSONS IN HISTORY 453
CHARACTER-TABLES. By JOHN ADAMS, M.A., B.Sc. 456
NATURE-KNOWLEDGE. By JAMES KNIGHT, M.A., B.Sc. 458
MAP-MAKING. By A. J. HERBERTSON, PH.D. 460
HOW TO COMPILE NOTES OF LESSONS. By T. HUDSON, Head-Master of Kepler Board School, Leeds 461
A COURSE OF OBJECT LESSONS FOR GIRLS' SCHOOLS. By WILLIAM DONE, B.A. 462
ARITHMETIC TESTS 464
THE INSPECTOR'S NOTEBOOK 466
OUR MODEL INFANTS' SCHOOLS 467
STRING: EXAMPLE LESSON 471
OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE. By A. T. FLUX 472
GENERAL INFORMATION FOR SCHOLARSHIP 477
NOTES ON "QUENTIN DURWARD" 478
OUR CERTIFICATE COURSE FOR 1902. By G. COLLAR, B.Sc. 479
LONDON MATRICULATION. By C. J. PHILLIPS, M.A. 482
OUR QUERY COLUMN 484
PHYSIOGRAPHY 487
CHEMISTRY 487
ELECTRICITY AND MAGNETISM 489
THEORETICAL MECHANICS 490
OUR FRENCH AND GERMAN PRIZE COMPETITION 491
THE EDITOR'S TABLE 492

VOL. XXII
No. 9

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THE

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A MONTHLY MAGAZINE AND REVIEW FOR THE SCHOOL-ROOM AND THE STUDY

Vol. XXII. No. 9. MARCH, 1902. Price 6d.

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EDUCATION IN PARLIAMENT—FEBRUARY.

THE promise in the King's Speech was satisfactory—"proposals for the co-ordination and improvement of primary and secondary education." A "terse and lucid phrase," Mr. Yoxall called it, in his newspaper efforts to get the Government to "live up to" the King's words. But Parliament is *par excellence* the scene of slips between cups and lips; the palace of Westminster is the palace of Tantalus. A King's Speech is a programme, but "the management reserve to themselves the right to vary the programme," as they say at certain places of entertainment at night. And since "the King can do no wrong," by the law of the British Constitution it is not disloyal to say that His Majesty's word is by no means as good as his ministers' bond. The Education Bill is not yet tabled, and Mr. Balfour only "hopes" to table it before Whitsuntide. Now even the newest Parliamentary hand is quite aware that a big Bill has hardly any chance of translation into an Act unless it begins its career pretty soon before Whitsuntide.

Schools are not the only Parliamentary subject, and as yet there is no real passion for schools in South Britain; even the Welsh fervour seems to be cooling a little. The toga must yield to the sword, and amidst the clash of arms the still small voice of Education is hardly heard just yet. Little was said about schools during the debates on the Address to the King. The mere fact that an Education Bill was on the sessional *menu* was enough, by the rules of the House, to prevent the moving of an amendment to the Address. Otherwise an amendment, affirming the principle of One Local Authority for all kinds of schools in each local government area of suitable size, must have polled three-fourths of the House of Commons. It is wonderful how popular that idea has become. Six years ago it could count but one set of supporters. But that was a numerous and persistent set: it was the N.U.T.

A great London daily lately devoted a leading article to the power of the National Union of Teachers. The writer pointed out how well the Union was organised, centrally and locally; how it had "three very able spokesmen" in the House of Commons; and how the Government in 1896 and 1901 tried to offer a sop to the Cerberus of Russell Square. There are a few cantankerous men in the House of Commons who judge the education question by political and sectarian standards, and who, when they do not find the Union adopt the same criteria, shake the head and mutter "selfishness," "mercenary motives," and even "Tammany Hall." But, to the perpetual discomfiture of such unchristian judgments, the Parliamentary policy of the Union is continually refusing sops, and urging the best and most educational policy that can be pursued. The teachers' attack on the petty Education Bill of 1901, at a time when a Tenure of Office Bill was hanging in the balance, is a conspicuous instance of that. The Union has become the most influential force in education policies and politics, because it works out high ideals in a commonsense and practical way. Witness this question of One Local Authority. Seven years ago not a Parliamentary dog would wag his tail for it; to-day it is a principle everywhere acclaimed.

Rumour tells that the Duke of Devonshire has now become enamoured of that principle; and certainly the promise in the King's Speech bears out the rumour. The county councils have been privately approached as to their consent to become the One Local Authority respectively; it is believed that the town councils (as well as the county borough councils) have been similarly approached. One county council, and that not one of the smallest, deputationised the Duke of Devonshire against the plan. It is said that the deputation came out into Whitehall feeling rather drubbed and sore. The Duke had heckled them severely; he had shown them that their policy was not his. Indeed, the Duke seems to be waking up most marvellously. At Liverpool he whistled for a wind. He is getting a hurricane: "rude Boreas" almost cracks his cheeks with the emitted blast. And the winds all blow the ship the same way, towards safe riding in the roads of One Local

Authority. The flag of the policy of the National Union of Teachers flies proud in the gale.

Yet there are drawbacks. "No man is wise at all hours," the sundials mutely tell us. A sinister rumour is whispered down the wind. It is that the mayors of the London boroughs—of Hackney, Westminster, Kensington, Camberwell, St. Pancras, Islington, and so forth—have been flattered by the Board of Education with the wheedling suggestion that the brand-new Metropolitan Borough Councils might take over, in parcels and bits, the powers and duties of the London School Board. That would be a bitter and noxious pill. The teachers would dislike it, the London School Board would hate it, the London County Council would hardly approve it. The proposal would unite Mr. Lyulph Stanley, Mr. Sidney Webb, and Mr. Marshall Jackman in a common bond of joint opposition. The rumour has little proof behind it, but much probability. The Duke of Devonshire, Sir John Gorst, and the permanent Board of Education, too, have small cause to love the London School Board. They will have a plausible pretext for devolution of the kind, if they propose it. Did not the London School Board, quite recently, by resolution affirm the probability, and refer to a committee the task of proof, that London Board School education had ceased to be quite efficient now that the iron days of individual annual examination are past?

The House of Commons does not take a benevolent attitude towards examinations. Hardly a debate on education in which there is not some condemnatory reference to the tests which seduce students into cramming. Attempts to throw the schools back into the days before 1889 will meet with little countenance at Westminster. And the House is not disposed to favour the crusade against corporal punishment in schools. Last year Sir John Gorst sought to cast the slur of cruelty upon teachers in public elementary schools; and even Sir John Brunner, eager educationist as he is, did something to help him. But the M.P.'s who went to Eton, Rugby, Harrow, Marlborough, and so on, remember their own Homeric swishings—the good derived from them, the desert which preceded them. And Sir John Gorst will need to be very cautious, if, as it is thought by some, he means, in the Code to be tabled in March, to give the anti-punishment rules another turn of the screw.

Very calmly the House of Commons has received the Draft Order in Council for a Register of Teachers. Colonel Lockwood, on behalf of the Municipal Association of Head-Masters, does not seem to have much to say against the plan, and the "three very able spokesmen" appear to feel that the plan is not detrimental to the members of the N.U.T. The Draft Order in Council was drawn up and settled as long ago as July last, it is said; and the delay is laid at the door of that eccentric minister, Vice-President Gorst. The tale of his sins grows long. Rumour insists that he is not to be allowed to introduce and pilot the Education Bill in the House of Commons. His caustic and sarcastic tongue is feared even more by the Government members than by the Opposition. Indeed, again and again he has played the Opposition's very game.

Committees on education, composed of M.P.'s voluntarily coming together for the purpose, have begun to sit at Westminster; and preparations for receiving, fighting, or amending the Bill when it appears are already in train. Something has been done in educational matters apart from the big dish of the bill in view. Dr. Macnamara successfully pressed the Home Secretary to adopt the question of child-labour out of school hours for the subject of a Departmental Bill; Sir Joseph Leese returned to the attack about the delay in the Teachers' Tenure of Office Bill; Mr. Yoxall is at work on the scandal of the inspectorate appointments; Mr. J. A. Campbell is stirring up the Lord Advocate about continuation schools in Scotland; and other detailed matters of the kind are in hand. Opinions on what the Education Bill ought to be and might be, nay, *must* be, are converging towards something like unanimity on principles. Extremists like Mr. Channing on the Liberal side, and the Cecils on the other, are more and more discounted. Precipitation of suspended opinion is taking place. The university and schoolmaster M.P.'s take counsel together. They are in earnest. Grass will not grow under the feet of the educationist M.P.'s, it is clear. "Education in Parliament" is alive and kicking again.

FERULA.

BY MANY HANDS.

"Quot homines, tot sententiæ."

ANOTHER microbe has been discovered—at least so says Dr. Ox of the *Matin*—and this time *in the ink!* Little boys and girls who have formed the undignified habit of putting their pens between their lips must now beware. There is death in the pot, or rather ink-pot. From its habitat this microbe has acquired a gloomy character, not to say a black heart, and we are assured that it is allied both to the bacillus found in mildew and also to that of tuberculosis. What a horrid genealogy!—the bacillus of the ink-pot claiming cousinship on one side with the mildewed microbe, and on the other with the consumptive bacillus. Its effects were tried on rats and other animals, which, after a few drops of the inky fluid had been injected, felt very ill, and died some three days later of a Black Death.

Death in the (Ink) Pot.

Where next will a microbe be found? Is there by chance a lead-pencil bacillus? Because the number of those who moisten the end of a pencil with their tongue is infinitely greater than the number of those who lick their pen.

* * *

IN Napoleon's army it was said that every private carried a marshal's *bâton* in his knapsack. And in America, corporal punishment is said to be administered while the patient is under the influence of an anæsthetic, because every schoolboy is a potential President of the United States. From the latest announcement of the *Journal Officiel* of Senegambia, we feel inclined to make a third statement—namely, that every teacher holds in his parchment certificate the possibility of becoming a king.

Pedagogue—and King!

For on the banks of the Senegal, in the French colony of that name, a teacher, at present a paid official of the colony, has just been elected "King" by the notables of the district in which he is working. His first kingly act, says the same official gazette, was to raise considerably the stipend of the entire staff of primary teachers,

BRITISH MUSEUM

knowing by experience the disproportion between the office and its recompense—thus proving that "young Ambition" does not always "scorn the base degrees by which he did ascend."

The teachers' certificate leads to many places, even to a presidency: witness M. Félix Faure. But—to a kingdom! We must go to Senegambia for that.

THE School of Bedales, which evoked such unstinted admiration from M. Edmond Demolins, author of "*A quoi tient la supériorité des Anglo-Saxons?*" has entered on another experimental phase. Girls are now admitted, to share as completely as may be found possible in the novel system of education hitherto offered to boys only. It is a phase which presents features of unusual interest, and one, we feel sure, that will be watched closely by all who are anxious for real progress in education. The girls live in a separate building, but join the boys in all classes, both of headwork and handwork. They even join them in some of their games; but such as are unsuitable to girls, as football, are replaced by hockey. The practical garden and farm work of the boys is changed for garden and dairy work in the case of the girls, but the same system of class-work, hygiene, physical instruction, and training in practical skill reigns over pupils of both sexes.

A Novel Experiment.

"MIXED" schools are nothing new so far as primary education is concerned in England, and even in higher grades in America. But a mixed boarding school, and of such a novel type as Bedales, is at once a great innovation and an interesting experiment. We have much sympathy with the unfeigned admiration expressed by M. Demolins, for we think that the founder of Bedales, Mr. Badley, is on the right track in his eminently sensible, practical, and at the same time scientific system. The only source of regret is that an experiment of this kind is only possible on an expensive scale, and among the children of well-to-do people. And yet the more one reads of Bedales, the more is one convinced that here (or in some modification of it) is the thing that is wanted, not for a few chosen ones, but for the greater number; a system that will "develop *powers* in a healthy and organic manner," cultivate self-reliance and initiative, and enrich faculty by bringing the pupil into contact with reality—real life, not merely books.

Girls at Bedales.

THERE is food for reflection for John Bull in the report of the American Consul at Liverpool on the economic conditions of Great Britain. Into his economic discussions we do not propose to enter, merely saying that Mr. Boyle thinks the British workman less adaptable than the American, and disinclined to work equally hard; that England cannot go on as she has been doing during the last quarter of a century, but that eventually hard times, the consequence of devouring competition, will come upon us. Then please mark the sequel: "With their habitual thoroughness, *they* [the British] *will undertake the task of reforming their educational system*, of modernising their system of manufacture, and of changing the restrictive customs and habits of the workpeople."

A Consular Judgment.

Notice what an acute American puts in the forefront of our requisites. It is a sentence that should be blared with trumpet voice from one end of the land to the other; for here we have our country estimated, weighed, and tested commercially, and declared wanting, because our educational system is "out of joint." The thought will at once arise in our readers' minds, as in our own: "Why wait till the hard times come?"

"FROM the age of nine to the age of fourteen the body should be cultivated in every school. Ninety-five per cent. of the weakly children could be made physically and organically strong. .....In New Zealand the Government has passed a Bill for national physical education. The English authorities have done nothing, except to issue a '*Model Course*' for the use of schools. This simply *is a hash of all the old notions, and in its forty pages there is but one breathing movement, and that is a bad one.*"

Physical Training: Sandow and the Code.

Thus the famous Prussian athlete, Eugen Sandow—the italics are ours—in his recent contribution, "In the Days of my Youth," to *M.A.P.*; and it is well to bear in mind that although he is possibly not omniscient, even upon the subject of physical culture, Sandow can fairly claim to be able to speak as "one having authority," and he certainly knows more about the best means to be employed in building up sound and muscular bodies than most people, including those responsible for the so-called "Model Course."

IT is, perhaps, too much to expect to find in a Government Code a clear statement of the actual benefits to be derived, and the manner in which such benefits accrue, from the performance of any particular exercise; although, as a matter of fact, such knowledge would tend to abolish the apparently too prevalent idea that the main object of physical instruction is the attainment, for purposes of display, of a maximum of smartness and precision of movement to a musical accompaniment. The practice of the art of physical education, equally with that of mental education, should be based upon a knowledge of the corresponding science; and by this is not meant a mere knowledge of the ordinary elementary text-book physiology.

Age and Development.

It will be observed that Sandow does not recommend systematic physical education to children under the age of nine; and although it is the writer's opinion that the culture of the bodily powers can be begun profitably at an earlier age, yet it cannot be too strongly insisted upon that many of the exercises in vogue in our schools are really unfitted for children in the lower standards. For just as children differ anatomically in several respects from adults, so younger children differ anatomically from older ones. From the simple fact that the order of muscular development—to say nothing of the motor centres in the brain controlling the muscles—is first those of the trunk, then those that move the limbs upon the trunk, and lastly those moving the smaller joints and extremities, the nature of the exercises best adapted for children of various ages may be roughly deduced.

TO the intelligent physical culturist, or at least to one unversed in codal peculiarities, it is almost incredible that the space given to breathing movements in the "Model Course" is practically a negligible quantity.

"But one Breathing Movement."

The usual statement that "we breathe to purify our blood" is one of those glib phrases that cover much haziness of thought, to say

nothing of downright ignorance, and which, as mental pabulum, starve while they satisfy. To rest there is to halt upon the threshold. Upon a proper supply of oxygen depends the efficient working of every gland and organ of the body, including the brain; upon it depend the proper assimilation of the absorbed food, and the strength of the muscles: the proper inflation of the lungs is a safeguard against consumption, and considerably aids the heart in vigorously circulating the blood. Even in a scheme, therefore, which "is a hash of all the old notions," the art of proper breathing might fairly be expected to receive more space than "one breathing movement, and that a bad one."

This is scarcely the place to deal with this neglected art in detail, but it may be pointed out that "vital capacity" is not increased by merely increasing the size of the chest by thickening its muscular walls, but rather by increasing its flexibility and elasticity, and by securing a proper carriage of the body; and, further, that at least as much attention should be paid to the vigorous performance of exercises bearing, directly or indirectly, upon respiration, as to securing the simultaneous striking together of, say, some sixty pairs of dumb-bells.

WITH OUR CHILDREN.

THE London Branch of the B.C.S.A. continues to do good work. The lecture recently delivered under its auspices by Mr. Holman, H.M.I., was of value from various aspects. The attempt to determine by direct experiment to what extent abstract reasoning comes into play at various ages of the school curriculum was in itself of interest, though the experiment does not seem to have yielded very definite results. The question is worth considering. We are apt to assume that we prove things to our pupils, when they are not of an age to feel the cogency of such reasoning as we employ, however conclusive it may be to the adult mind.

Child-Study in London.

We agree cordially with the suggestion made by the lecturer, that such points may often be best investigated by such indirect methods as we indicated last month—by the examination of exercises done in the ordinary course of school work.

AN inquiry into children's ideas of beauty has been made by Emma L. Gifford, Passaic, N.J., and reported to the New Jersey Association for the Study of Children and Youth (why not "Children and Youths," or "Childhood and Youth," we wonder?). The results and the method of the inquiry deserve some notice.

Beauty once more.

The question was set to the children thus: "What is the most beautiful thing you have ever seen? Describe it, and tell why you think it beautiful." This formed the ordinary language lesson for the day. Had the same subject been set in our schools, we should probably have avoided the interrogative form, and given the exercise, "Write an essay describing the most beautiful thing you have ever seen, and telling why you think it beautiful;" or we might have even omitted the latter clause, trusting to the description to give a clue to the reason why.

IN some such form as this, an exercise may be given by any teacher which will throw light not only on his pupils' power of writing English, but on their ideas of what constitutes beauty. This method of understanding the child-mind seems in every way preferable to a formal *questionnaire*. In an ordinary school exercise there is less temptation to posing. The writers are likely to concentrate their attention so much on the grammatical structure of their periods and the spelling of their words, that the actual ideas expressed will be those that come most readily to hand, from their original vividness or from their familiarity.

The Indirect Question.

It may well happen that the object is selected in some what of a hurry, and that if a pupil were closely questioned afterwards, he would admit that what he selected was not quite the most beautiful thing he had seen; on second thoughts he might have made a better choice. This is a matter of comparatively little consequence; the object named must at least be one which he considers to be notably beautiful, and that is the main object in the inquiry.

THE question mentioned was set to two thousand children, of ages ranging from eight to sixteen. If the subject were given as an essay, such a range in age would not be possible in our schools. Yet the "age curve" is of great importance as showing the development of æsthetic ideas with growth in years. Among our younger children, we should probably find it necessary to put oral questions in order to compare their ideas with those of our pupils who can write more fluently. Such oral questioning, to be of any real value, would require not only to be individual, but to be conducted so that each pupil's answers should be unheard by the others. This would imply some expenditure of time, which, however, might easily be worse spent.

The Range of the Inquiry.

SOME superficial objections to such an inquiry may be disposed of by these remarks of the writer of the report: "The papers, without exception, manifested a serious interest on the part of the writers to describe what they believed to be the most beautiful thing they had ever seen. .....Of the ninety-seven different objects which were considered 'most beautiful' by one or more writers, not one, it seemed to me, entirely lacked the element of beauty. The expression of every paper revealed that 'longing for refinement and beauty which every living soul possesses, and the germs of which remain in every human being, no matter how degraded.'"

Interest in Beauty.

WITH ninety-seven different objects named, and probably still more different reasons given for the selection, it was naturally difficult to arrive at any classification of results. The first broad distinction was between "natural" and "artificial" objects. This distinction, when reduced to figures and represented graphically, shows that the "natural" line rises considerably, though not quite uniformly, between the two limiting ages of eight and sixteen.

Classification of Tastes.

In the next place, the objects most frequently selected were listed. These were—scenery, flowers, animals, and dolls. The last was chosen by girls only, and in the highest percentage (10 per cent.) between the eighth and ninth years of age. This is in accordance with a study formerly made by Dr. Stanley Hall, which resulted in

his placing the height of the doll fever at precisely this age.

Animals are chosen at all years, and by boys more frequently than by girls. The animal choice reaches the high percentage of 33⅓ at nine years. This is surely an important fact for teachers to know regarding the interests of children.

Flowers also have many admirers, the maximum here occurring at the age of twelve years. At that age, 25 per cent. of the girls select flowers. Colour and scent are, of course, the reasons given for the admiration of flowers.

Above the twelfth year, scenery takes the leading place in æsthetic preference. In the sixteenth year, the percentage of pupils making this selection rises to 50 among the boys and 76 among the girls. At the eighth year, the percentages are only 8 and 2 respectively.

Among the favourite elements of natural scenery, waterfalls are often mentioned. Sunset is not mentioned until the eleventh year, but from this time onward it is the favourite natural phenomenon, and in the sixteenth year is mentioned in as much as 32 per cent. of the papers.

NOTES FROM THE NORTH.

CIRCULAR 340 is one of the most important documents issued by the Scotch Education Department with reference to the subject of Leaving Certificates, and entirely supersedes the existing regulations for Group Certificates, except in so far as application for these latter may still be made on behalf of such candidates as have fulfilled the whole of the necessary conditions not later than the examination of 1901.

Leaving Certificates.

This circular contains the conditions under which it is proposed that Leaving Certificates shall in future be issued. There are now to be two classes of certificate—the Leaving Certificate proper, and the Intermediate Certificate. The former is intended to mark the completion of a full course of secondary education. To prevent over-pressure, the minimum age at which the certificate will be obtained has been fixed at seventeen, and applicants must have been receiving higher instruction at some recognised school for not less than four years.

So far as the written examination is concerned, the following conditions have been laid down:—Candidates, in order to obtain the certificate, must have passed in four subjects on the Higher Grade standard, or in three subjects on the Higher Grade standard and two on the Lower (Higher English in each case being one, and either Higher or Lower Mathematics another). A pass in Drawing may be accepted in place of one of the two Lower Grade passes. The other subjects may be either all languages or Science with one or more languages; but where two or more languages other than English are taken, Higher or Lower Grade Latin must be included in the group. By a subsequent circular, dated 6th February, the latter condition has been modified. The Department feels that if this provision were to become operative at once, a certain amount of hardship might be entailed in the case of those pupils who may now be approaching the end of their school course, and who have not yet devoted any time to the study of Latin. They have decided, therefore, to postpone action in this direction till the examination of 1904. In subjects where there is only one examination—as in Spanish, Italian, or Science—a pass is to be reckoned as equal to a Higher Grade Certificate, and a pass in Honours is to cover a Higher Grade, and one in Higher Grade a Lower. The grade of pass is to be recorded on the face of the certificate, and passes in additional subjects are to be likewise endorsed on it.

* * *

INTERMEDIATE Certificates are primarily intended to meet the case of those schools which, although they may be doing valuable work in secondary subjects, are yet unable, from one cause or another, to retain their pupils long enough to enable them to reach the standard of the Leaving Certificate proper. They are to be open to pupils of any school who may satisfy the prescribed conditions.

Intermediate Certificates.

Applicants for Intermediate Certificates must receive instruction at a recognised school for not less than two years, and the minimum age at which the certificates may be obtained has been fixed at fifteen. Candidates for this certificate must have passed in four subjects, at least one of these being on the Higher Grade. The two compulsory subjects are English and Mathematics (Higher Arithmetic being reckoned as equal to Lower Mathematics). The remaining subjects may be either Science with one language, or languages only. Since there is only one examination in Science, and that on the Higher Grade standard, it will be sufficient to satisfy the inspector on his visit to the school as to the due instruction and progress of the pupils in experimental science, and similarly with Drawing.

* * *

THE Department, by the issue of Circular 345, has intimated that it is now prepared to consider applications for the examination in Drawing of pupils in secondary schools or in the higher grade or advanced departments of elementary schools, with a view to the issue of a certificate of attainment. The examination is to be reckoned as an integral part of the Leaving Certificate examination.

Drawing.

In order that applications for examination may be entertained, the Department must be satisfied (*a*) that the school is suitably equipped for the purpose of giving instruction in Drawing; (*b*) that the qualifications of the teachers are such as may be approved by the Department; (*c*) that the curriculum of instruction is satisfactory (where scheme has been already approved of, this condition will be considered as satisfied for the present year); and (*d*) that pupils are over fifteen years of age, and have been under instruction according to the approved curriculum for at least three years (two hours a week being the average time required to be given to the subject). Forms for this examination should be sent to Department not later than 25th March.

* * *

COPIES of a summary of the provisions of the Youthful Offenders Act of 1901, and of the form of register which, by Section 13 of the Act, is to be kept of offenders under the age of sixteen years, have been supplied to the Education Department, and through it to School Boards, by Lord Balfour. The Department in the covering letter refers to the exemptions under the new Education (Scotland) Act, and suggests that if the offender is one who is exempted from school attendance, the fact should be noted, and consideration given as to whether the exemption should be withdrawn.

School Boards and Youthful Offenders.

There is, however, the circular letter adds, a wider aspect of the case. Notwithstanding the prominence given to the matter of discipline and inculcation of good habits and the instilling of right principles in Article 19 of the Code, there is much reason to fear that the school is often looked upon as a place for imparting a certain amount of instruction in various subjects. The former, the Department thinks, should be rightly regarded as the more important, and it cannot be too clearly recognised that the discipline of the schoolroom has largely failed of its effect if it is not reflected in the bearing and conduct of the pupils outside the school precincts.

IN answer to a question by Dr. Macnamara in the House of Commons, the Lord Advocate for Scotland stated that since the Board of Education Act, 1899, did not apply to Scotland, the Scotch Education Department did not propose to issue an Order in Council establishing a Register for Teachers. When occasion arose, the Department would consider what steps might be required with any such register. The irony of fate is here again. Instances have occurred within recent years, notably when the Superannuation Act was passed, when it would have been better for Scotland to wait and see the working of new legislation; but in this case we could have readily stepped side by side with England. The delay, however, may suit "canny" Scottish legislators.

Registration of Teachers.

Another very important reply was given in the House of Commons the same evening in connection with the Continuation Class Code in Scotland. The Lord Advocate then stated that representation had been made as to the difficulty in some of the poorer districts of raising even the moderate amount of local contribution required by the Continuation Class Code of Scotland. The matter, he said, would receive consideration when the Code was under revision. In connection with the exemptions under the Education Act 1901, this will have the effect of keeping children at school in these districts until they are fourteen years of age. Would that such were the case, for other reasons, in many of the larger city centres, where I am led to understand exemptions are being granted with a somewhat free hand.

THE question of a Parliamentary representative is being discussed in the various branches of the Institute, and is having a very mixed reception. It would appear that the Institute is not yet ripe for such a step. It is a hundred pities that such is the case, as there can be little doubt that such representation would have a valuable effect on future educational legislation. The decisions of the various branches will be awaited with interest.

E.I.S. Topics.

The nominations for the president and vice-president move slowly. Mr. A. T. Watson, Dumbarton, is the only nominee for the presidentship; while Mr. J. C. Beattie, Oban (for the third time), and Mr. George Fenton, Aberdeen, the first class teacher candidate, have been nominated as vice-president. There are likely to be more candidates, the voting having been put back for a month this year.

ST. ANDREWS University have agreed to confer the degree of LL.D. on the ex-president of the Institute, Mr. A. Menzies, Kirriemuir. We heartily congratulate him and the Institute on his new honour. R. G.

Congratulations.

IN MEMORIAM.

MR. CHARLES MANSFORD, B.A.,

Formerly Vice-Principal of Westminster Training College.

ON January 30 there passed away, in peaceful retirement at Clapham, Mr. Charles Mansford, whose noble character has for many years indirectly, but most beneficially, influenced a large number of the day schools of the country. Born in 1833, of Wesleyan Methodist parents, in Lincolnshire, he early began his career as a teacher in the Lincoln Wesleyan School. In 1853 he entered the Westminster Training College, and thenceforward for thirty-five years, as resident tutor and as vice-principal, was continuously connected with that institution. In 1888 his active work was suddenly ended by a paralytic seizure, which obliged him to retire to Brighton, where he resided till September last. There, as some measure of strength was restored to him, he used his pen as often as he could, both in the service of his church and in the cause of education, which lay so near to his heart. But the chief work of his life was done at Westminster; and as great educational changes took place when

MR. CHARLES MANSFORD, B.A.

he was in his prime, his voice respecting them was not unheard in high places. Reviewing that period, it is interesting to ask what were the formative influences in his career. And remembering that he was a Lincolnshire man, one notes the coincidence that they came chiefly from two of the most distinguished men his own county has produced. The one was John Wesley, and the other Alfred Tennyson. The church of Mr. Mansford's fathers was also the church of his choice, and few men, perhaps, knew more than he of its history and its polity. Wide and practical was the view he took of the great revival of the eighteenth century, which stirred up the villages of England to a brighter and better life. It may not, perhaps, be going very far wide of the mark to place to its account the fact that when, in the middle of last century, the Wesleyan Church founded its first training college, such a youth as Charles Mansford was supplied by a village to become one of its earliest and best tutors. During the long residence there which followed, hundreds of young men passed to his guardianship from the security of rural homes and their parents, who might have felt anxiety about exposing such to the temptations of the

metropolis, soon learned that their sons were in the care of one who was pre-eminently "pure in heart and strong in brain." The gratitude and respect felt by these young men may best be told in the following words, written recently by one of them to a friend:—"He [Mr. Mansford] was a man who influenced me very largely indeed, and much of the little that is of sterling value in my character I owe to his teaching when I was a student. He really made it difficult for any student, with any moral fibre at all, to go wrong, and I am sure generations of Westminster men will agree with me in this. He has passed away, but he leaves a glorious record behind him." And this influence was not due alone to the fact that Mr. Mansford was a disciplinarian of the best type; there was something in himself, apart from precept, that *attracted* to right-doing the youth about him. He took the little things of life and lived greatly amongst them, and such manliness gave authority to all his teaching. This innate integrity was shown also in another direction, where it could not fail to impress young men of every type. One part of Mr. Mansford's duties was to give the Sunday morning lectures on New Testament doctrines; these were marked not only by close study of the subject and by careful preparation, but there was internal evidence that the audience for whom they were intended had also been closely studied. This wise teacher of teachers, keeping himself abreast of the thoughts of the day, was able to realise that the flood of light which modern science has brought to some minds has brought darkness to others. It would have been the easier part to ignore this twofold fact, but in his courage he preferred to grapple with difficulties from the standpoint of his young hearers as well as from his own. Nor was the secular side of his work, which was chiefly mathematical, less well done; long ago it earned high praise from Mr. Matthew Arnold. Of his text-books on arithmetic and algebra it is needless to speak; they are still in daily use, and therefore well known.

Mr. Mansford's great aptitude for teaching was, without doubt, kept at a high point by his natural love of study, and perhaps all the higher because his studies were carried out not in the same groove as his tutorial work, but away in the field of poetry; and what he had made clear to himself he loved to interpret to others. This was particularly marked in relation to the poetry of Tennyson, which was the second great inspiration of his life. The "In Memoriam" was to him a source of solace and enjoyment in health and in sickness, and to the very end. The present writer recalls a recent visit to Mr. Mansford when his favourite volume was in his hand. "Still your beloved Tennyson." "Oh yes," he replied; "here is beautiful thought in beautiful language."

Many of Mr. Mansford's old students possess, as a memento of his lectures on his favourite poem, an analysis of it from his pen, given to them not as part of their classroom curriculum, but as a change from it—as a refreshing bypath in another direction. To others who have had the privilege of knowing Mr. Mansford in private life as well as public, his appreciation of Tennyson was very striking. Either the poet helped greatly to mould his character when young, or it was already cast into such a mould that it could not but respond to what was the articulation of the distinctively nineteenth-century spirit. It would be almost possible to summarise his character by quotations from the "In Memoriam" alone. The attraction was not wholly due to love for nature—Wordsworth could have satisfied that love: there were other chords in Mr. Mansford which the nature-poet could not touch. Mention of love of nature will remind some former students of those Saturday half-holidays on which their vice-principal used to hie away with some chosen friends to the green lanes of Kent, or the breezy commons of Surrey, to drink in their freshness and beauty, and awhile forget the misery and squalor that surround Westminster College. And what friends they were who shared this simple pleasure, and to it contributed their own bright thoughts! Three of them have long since passed away—Professor Parker, James Smetham, and Mr. John Wood, M.A., of King's College. But years of weakness were to follow to him over whom the grave closed on Tuesday the 4th of February. The day was inclement, but a representative gathering—including, besides Dr. and Mrs. Newsholme and other relatives, Mr. James Bailey of Southlands, Mr. Langler of Westminster, Mr. Healing, H.M.I., some past Westminster students, and other friends—listened to a sympathetic address at Norwood Cemetery by Dr. Waller, in place of Dr. Rigg, who had hoped to be able to take the service. As some of these mourners looked into the open grave of their friend who has left only fragrant memories behind, they added to their farewell the words of his favourite poet, "O tried and true, so well and long," and then left him there to rest.

J. M. D.

NOTES AND JOTTINGS.

A COURSE of Lent sermons for elementary school teachers is being given on Thursdays at one o'clock in the Church of St. George the Martyr, Southwark, by clergymen well known for their interest in the work of teachers, including two present and two past members of the London School Board.

The Order in Council provides that the Teachers' Registration Council, to be constituted for the purpose of forming and keeping a register of teachers, shall consist provisionally of twelve members, of whom six shall be appointed by the president of the Board of Education, and of the remaining six one member shall be appointed by each of the following bodies: The Conference of Head-Masters, the Incorporated Association of Head-Masters, the Association of Head-Mistresses, the College of Preceptors, the Teachers' Guild, and the National Union of Teachers.

This constitution will remain unchanged for three years, at the end of which time it may be revised by Order in Council.

Subject to the approval of the Board of Education, the Council may appoint a registrar and other officers, may charge fees for registration, and may pay its members fees for attendance and travelling expenses. The Council must present an annual report and balance sheet to the Board of Education.

The register will contain an alphabetical list of names, a column for certificated teachers, and one for non-certificated teachers who are entitled to registration by possessing a degree or other recognised academic qualifications by having gone through a course of training, and by having spent one year's probation in a recognised school. For teachers making application within three years, these rules may be somewhat relaxed; in fact, a head-master or head-mistress of a recognised school can claim to be put on the register if he or she has held the office for at least one year previous to the date of the application.

The Order also provides for supplementary registers for teachers of music, drawing, etc.

Certificated teachers will pay no fee unless they wish to register qualifications or experience other than those required by the Board of Education from certificated teachers, in which case the fee is half a crown. Non-certificated teachers will pay a guinea for simple registration, and half a crown for registration of additional qualifications.

The Board of Education is anxious to encourage the teaching of gardening in rural schools, and has issued a syllabus of work, and an account of schemes in actual operation in some schools. This may be the first step towards greater liberality in the treatment of our rural schools.

As soon as the conflict of arms ceases in South Africa, and indeed before, there will be an influx of teachers. Not only are many going out to the concentration camps, who will probably settle in South Africa, but it is proposed to endow a chair of history in the South African College, Cape Town. As ignorance and credulity are largely responsible for the present war, so we trust that education and enlightenment may lead to peace and good will among those who will dwell together as neighbours in the future.

On Wednesday, February 5, H.R.H. Princess Louise presented the prizes to some of the successful students at Battersea Polytechnic. This successful institution has already been three times enlarged, and plans are in hand for further extension. During the last session no fewer than 3,100 students joined the evening classes, and among the successful ones were seven who passed the Intermediate Science Examination of the London University, and six who completed the degree of B.Sc. The Duke of Argyll, in acknowledging the vote of thanks passed to the Princess, praised the work, especially of the tool-making department, and urged the desirability of founding some travelling scholarships.

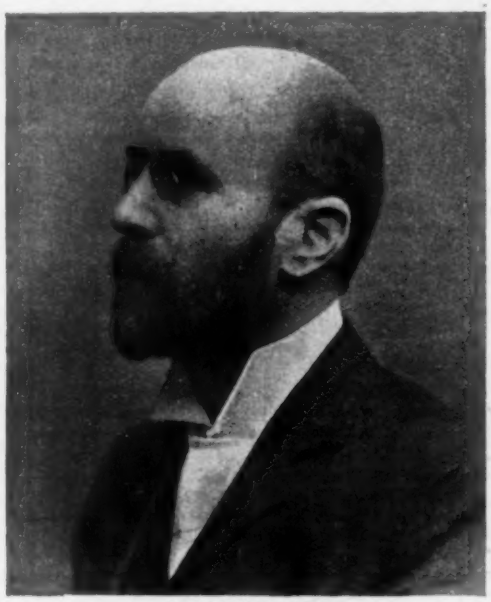
THE COMING CONFERENCE OF THE N.U.T. AT BRISTOL.

THE PRESIDENT-ELECT.

ALLEN CROFT! Only those who have enjoyed the friendship of the subject of this sketch can know the subtle charm conveyed by the utterance of this name. They feel the loss of some peculiarly attractive euphony if any addition by way of courtesy be attempted. A name well known to readers of *The Practical Teacher*, *The Schoolmaster*, and other educational organs, but dear to a large circle of friends, and universally uttered with affection amongst the teachers of Nottingham.

Early Life.

Born at Branderburton, a typical East Riding village, about six miles from the bracing blasts that sweep the North Sea, some forty years ago, he spent the first nine years of his life in the county of broad acres. His father, worthy yeoman though he was, mistrusted the adequacy of the village school for his son's education, and, in spite of his tender years, packed Allen off to the Emanuel School, Westminster. These were the days before science had claimed any appreciable hold on the curricula of public schools; hence to this time may be traced the fondness for classical allusion that now and again must have vent, providing innocent matter for the pleasantries of his intimates. However, such was his aptitude and fondness for the old masters, that they find an honoured place on his well-filled bookshelves today. His intimates will assure you he finds relaxation in the inimitable epigrams of Horace as well as in those of our own Meredith.



MR. ALLEN CROFT.

Student-Teacher.

Having served the last four years of his stay at Emanuel as student-teacher, he was attracted by the enthusiasm shown in the country for primary education. The rapid building of schools necessitated by the Education Acts of this time, together with the zeal manifested on all sides for educational reforms, promised well for the future of the primary teacher.

He had little difficulty in securing places of honourable distinction in the first class of both the religious and secular examinations for entrance to training colleges. He naturally elected to receive his technical training in the heart of the county of his birth. We may well believe the testimony of Yorkists of 1880–81 that Allen Croft, as monitor, had no difficulty in gaining the affection and confidence of students and tutors alike. A man of strong character, he early showed that he had the qualities of a leader and persuader of men.

The erect carriage, broad shoulders, and general appearance of the healthy Yorkshireman proclaim him to have been a devoted follower of athletics. He carried his love for all forms of sport from his school to the college grounds, and we find him popularly acclaimed secretary of the college cricket and football clubs. He still follows the fortunes of county cricket with the zest of his early days. His form is familiar to frequenters of the Trent Bridge ground. The school doors have not long been closed before he is to be found amongst the keenest critics of the historic English game.

Courtship and Marriage.

We all know how the romantic scenery of the Lake District regularly attracted Arnold of Rugby, winter and summer. The proverbial schoolboy will tell you how its beauties inspired an immortal school of English poets. What wonder, then, that the voice of Mr. Croft always seems to take a tender poetical intonation when referring to the happy two years spent in the heart of this glorious district. The walks by the banks of Eden, the gliding o'er the solemn waters of Buttermere, and the visits to the delightful islets of Derwentwater—that queen of lakes—had better be left to the imagination. Suffice it here that from Penrith came the charming hostess who, during the past fifteen or so years, has entertained not only many happy parties of local workers, but most of the present leading lights of Union efforts.

At Home.

Immediately the threshold is crossed, the manner of man living here is patent to all. Photographs, etchings, prints, unpublished, and the originals of published, caricatures, all relating to celebrities in the N.U.T., cover each side of the entrance hall. Ushered into the dining-room, a crowd of faces familiar to Conference representatives look knowingly at us from their diverse settings. From this wall and from that, out of yon corner or this, comes some familiar expression. Here we meet the mild, sympathetic look of recognition from beloved Addiscott; there, the old-fashioned courtesy of Wild; another turn and we are face to face with the keen glance of the worthy doctor, and yet another brings us the enjoyment of the old twinkle of Jackman's merry eye!

If our business be purely social, here we may remain, ensconced comfortably in the low-cushioned chairs; but do we want facts, and are really intent on serious work, we must be taken to the "sanctum" set apart for such. There are still prints, etc., that speak of Union work here, but the wall space has been chiefly requisitioned for good "workaday," capacious bookshelves. In these one cannot help noticing how particularly obtrusive are the formidable tomes of *The Schoolmaster*, bound volumes of *The Practical Teacher*, rows of blue books, and other evidences of the expert given to research and the digging out of facts and figures. The orderliness of the busy man is evident at every turn. Authorities are consulted with the rapidity of a highly-feed K.C. Is it a question of dates? out comes the diary for the year, and the problem is swiftly answered. An interesting wall decoration is the map of England, showing the cities and towns in which Mr. Croft has addressed meetings. A glance is enough to convince us that Mr. Croft must be familiar with his Bradshaw, for the red lines

seem to include all the county towns and boroughs in the country.

Should the conversation not be private, but upon matters of general Union interest, when Mrs. Croft enters, you would not please her by seeking to divert it into other channels. She has entered enthusiastically into the cause so dear to her husband, and can shrewdly discuss the educational topics of the day. Indeed, her husband will gratefully point to a mass of work that could not be done without the help so willingly given by his devoted wife.

This is the room in which reforms and reformers, policies and means, have been discussed; whilst in the adjoining room the mind is carried back to many a festive gathering round the mahogany, when good-humoured quips or merry jests were in the air. Here has been much merry-making of a congratulatory character, as some victory has been added to the cause of educational progress, or some distinguished visitor entertained.

Had Allen Croft's pen and voice been silent *coram populo*, and his work on behalf of teachers confined to 221 Woodborough Road, he would still be regarded by his hundreds of guests as the disseminator of a real Union spirit and principles by that most potent influence, tactful hospitality.

Professional Code of Honour.

The easy affability of the "man of affairs," and the cordial comradeship extended to all engaged in a profession whose honour is ever dear to his heart, are qualities inseparable from "Allen Croft." As a young man he quickly realised that something was wanting amongst a section of teachers in the matter of professional etiquette. The absence in this section of what may be called the "freemasonry" of a profession struck home at a heart incapable of meanness at any time, but that filled with indignation at the cases of gross "unprofessionalism" that now and again saw the light. Bitterness finds no place in his tone, either of voice or heart, when dealing with ordinary topics; but let him get "warmed up" on this subject, and his voice takes an acerbity that seems to be cutting the diseased member off from the body corporate as keenly and as surely as any surgeon's knife. Woe to the blackleg supplanter of unionist! Woe to the character-ruiner that works by secret reports!

Local Association Work.

Mr. Croft had not been long in Nottingham before it became recognised that a fresh and vigorous personality was making itself felt. A telling debater and originator of policies, he soon found his way to the committee of the local N.U.T., and on through various offices to that of president. As his work whilst organising secretary greatly increased the roll of members, so his popularity when president added largely to the interest in association gatherings and work.

Always recognising that the N.U.T. must be the common centre of interest for all classes of teachers, he saw no conflict in specially focussing the policy of assistants by means of a separate association. At his instigation, and under his presidency, the Nottingham Class Teachers' Association came into being in 1888. When, ten years later, he again accepted the chair, the assistants showed their appreciation of his strenuous services on their behalf by presenting him with a valuable gold watch, at the same time pleasantly recognising their debt to Mrs. Croft with a handsome diamond ring. The fact that during those ten years the maximum salary obtainable by an assistant had risen £60 a year, speaks eloquently of the work accomplished by the association under the guidance of Mr. Croft.

National Work.

Such was the success of combination at home, that he undertook, at his own charges, missionary journeys to other centres. He also began to use the columns of *The Schoolmaster*, urging the formation of a federation of assistant teachers. The proposal was met at the outset with strong opposition from the Union spokesmen and from several leading assistants, fearful lest its development should prove antagonistic to the N.U.T. Time has proved such fears groundless. The work already accomplished by that organisation—steady advance of salaries, abolition of C.P. regulations by the leading School Boards, added strength to the N.U.T.—witnesses to the foresight and the organising ability of its first president and present popular treasurer.

It is pleasant to recall that the nomination of Mr. Croft for the Executive, and afterwards for the vice-presidency, emanated from the ranks of the head-teachers, amongst the active members of whom he is as popular as amongst assistants. Indeed, his wide grasp of educational problems, and his indisputable catholic sympathies, have secured for him the respect of all classes of teachers. This was proved by the position he obtained on the poll for the Executive at Manchester in 1895. He was rapidly nearing the top round under the old system, when the Electoral Districts scheme came into force. Since then he has headed the poll for the North Midlands.

Executive Work.

Mr. Croft is not given to flowery figures of speech, nor indeed to speaking at all unless there is some definite point at issue. He is best studied when at the solid work of committee. It may safely be averred, no one enters a committee room with a more accurate knowledge of the agenda, or with keener methods of getting through it with expedition and thoroughness. His capacity for detail is a subject of admiration to his Executive colleagues. For four years as vice-chairman to Mr. Wild on the Education Committee—of whom he always speaks in terms of warm regard and respect—he did much to bring about acceptable changes in the Code. His work on behalf of the Law Committee is gratefully acknowledged by the teachers who have had cause to welcome his diplomatic skill in extricating them from difficulties requiring delicate handling.

Bath Street Board School.

Here, during his workaday life, may be seen the president-elect. This is one of the "difficult" schools in the east end of Nottingham. Amongst the poorest children he is doing a work that, in the nature of things, cannot be rewarded here. That he has carried some of the sweetness of his own culture into the lives of his boys is well known to all who labour in this district.

Mr. Jefford, the head-teacher, will tell you he is proud of his right-hand man. He speaks with unfeigned pleasure of the successful career he has watched with interest from the first.

The Future.

That the subject of the status and the emoluments of assistant teachers will claim a large part of the Presidential Address, and a prominent position in the active propaganda of the Union during Mr. Croft's year of office, may safely be prophesied. No better example than Mr. Croft himself of the changed condition of things for assistants could be found, nor any abler exponent of a sound remedial policy. That he will make wise use of his opportunity need not be doubted. At the same time the general welfare of the body of teachers, and the great principles for which all educationists struggle, will not be neglected.

A man of splendid physique, enjoying to the full the prime of manhood, Mr. Allen Croft's work is still with the future.

CANDIDATES FOR VICE-PRESIDENCY.

"BE not afraid of greatness," read the delighted, though befooled, Malvolio: "some are born great, some achieve greatness, and some have greatness thrust upon them." And truly it may be said of the successful aspirants to the Union's presidential chair that they "*achieve* greatness." For this distinction, although the accident of birth and the persistent efforts of enthusiastic friends may aid, is nevertheless rightly awarded to the men possessed of an honourable record in their profession, and years of arduous and devoted service on behalf of their fellow-teachers. The vastness of the constituency is almost overwhelming. With an electorate now well past 45,000, whose domicile is anywhere between Berwick-on-Tweed and Penzance, or Lowe-

stoft and St. David's, it is no easy matter for the most active Unionist to become known to even a tenth part of those privileged to vote. The ever-increasing roll of Union members, though gratifying and satisfactory in itself, entails more and still more expense on the part of the candidates or their friends; and it is now an open secret that £150 has barely sufficed for the election expenses of recent vice-presidents. Whether this is altogether a good thing for the Union, it is not now our province to discuss; but the fact remains that a candidate must, either from his own purse or by the help of admiring and sympathetic friends, spend largely on printing, postage, advertisements, etc., or be seriously handicapped in the contest. So much by way of exordium.

This year's election is quite as interesting as those of yore. Three gentlemen, all chairmen of important committees of the Executive, are in the field; and, in addition, a fourth candidate presents himself in the person of Mr. Muscott, a rural teacher, and former member of the Executive. A few facts regarding the candidates are subjoined, in the hope that all readers of THE PRACTICAL TEACHER qualified to vote will promptly do so, and return their papers to Russell Square.

MR. HARRY COWARD

must be so well known to our readers that it savours of merest supererogation to recount the facts of his lengthy and honourable career. Away back in '95, a full account of his professional work appeared in our series, "Well-Known Teachers at Work." In 1900, and again in 1901, he came under review as one of the candidates for the vice-presidency, and is thus in the field for the third and *last* time, his friends confidently state. Certainly there is ample justification for their confidence. In 1900 Mr. Coward was fourth on the list, with 2,620 votes appended to his name. Last year, as "runner-up" to Mr. Allen Croft, he increased his poll to 12,287, in a contest memorable for the friendly and good-tempered fashion in which it was fought. This year he has been nominated by no less than 226 associations, a total of sufficient significance to accurately forecast next Easter's result. We forbear to again tell the number of his schools, and the good work done therein. In an association possessing more than the usual quota of able men, he has, by sheer merit, forced his way to the front, and held all the leading official positions. He has sat at the Executive board of the Union since 1896, and rendered splendid service on many of the chief committees. After acting as vice-chairman of the

MR. HARRY COWARD.

Superannuation Committee, he was last May unanimously called to the chair of the Law Committee, and in that responsible position has simply placed the members of the Union under an additional debt. His work on behalf of the charitable funds of the Union has been told over and over again, and his firm yet tactful handling of the annual meeting of the subscribers at the Cambridge Conference will never fade from the memories of those whose duty it was to be present. We can find no better termination to this "appreciation" than we used last year: "Whenever the Union sees fit to place Mr. Coward in the chair, he will prove himself a worthy successor to the many good men who have preceded him."

MR. T. H. JONES,

the talented and esteemed head-master of Burghley Road Higher Grade School, goes to the vice-presidency poll for

MR. T. H. JONES.

the first time, although he was nominated for the high distinction by many associations in 1901. From last year's contest, however, with the most noble self-abnegation, he publicly retired in favour of to-day's vice-president, believing it to be for the absolute benefit of the Union that its honours should be as widely distributed as possible, and also that the public estimation of the class teachers would be advanced were one of their number elected to the Union's presidency. So recently as August 1900, THE PRACTICAL TEACHER depicted Mr. Jones—at that time in charge of Duncombe Road Higher Grade Board School—so there is no necessity to again describe him *as schoolmaster*, enjoyable though the occupation would certainly be. As an Executive worker his record is probably unique, for the annals of Russell Square will assuredly never again chronicle attendances similar to these—199 Executive sessions out of a possible 203; 429 committee attendances out of 450 meetings! As a member of the country's premier association (Finsbury and City), he has achieved the highest honours, becoming treasurer in 1888, and president in 1892. He was the founder and first secretary of the Finsbury Card Scheme (which now secures annually over £300 for the B. and O. Funds), and is, moreover, a life member of both funds. For that powerful organisation, the M.B.T.A., Mr. Jones has laboured assiduously and successfully, and was called to the presidency in 1899. He is the senior member of the Executive seeking vice-presidential honours, and if a wholly self-sacrificing devotion to the interests of his fellow-teachers can secure them, they are as good as won. No more responsible position exists at Russell Square than the chairmanship of the Tenure Committee, and this Mr. Jones has held since its foundation. May we recall a sentence from our interview of August 1900: "On more than one occasion Mr. Jones has left school on Friday for the station, travelled all night, spent the whole of Saturday in investigating, and caught the train back to London on the Saturday night, arriving home in the early hours of Sunday morning, never

having had his clothes off since the preceding Thursday." We shall not attempt to strengthen the picture. In everything he undertakes, Mr. Jones is similarly thorough and whole-hearted. His school colleagues, past and present, ever speak of him in terms both cordial and enthusiastic. He is sincerely respected by every member of the Executive, and those who are privileged to know him intimately realise that there is no clearer thinker or better-informed man around the board than he. Modest and unobtrusive almost to a fault, his worth and work have nevertheless been recognised by nominations from such important associations as Finsbury, Chelsea, St. Pancras, Marylebone, Merthyr, Ipswich, etc. He is "one of nature's gentlemen, whose devoted labours on behalf of his fellow-teachers in his capacity as chairman of the Tenure Committee will never be known." Thus THE PRACTICAL TEACHER spoke of Mr. Jones a year ago, and the dictum still stands. Whenever the Union requires, as its chief Executive officer, a man with a clear grip of the education question, one ever willing to sacrifice personal ambition, comfort, and ease for his fellow-teachers, or one whose constant and unceasing sense of responsibility is rarely equalled, and can never be excelled, it need look no farther than Mr. T. H. Jones, a strenuous defender of teachers' privileges.

MR. WILLIAM MUSCOTT

is, so far as can be ascertained, a candidate for the vice-presidency because he thinks the rural teachers ought, sooner or later, to furnish the Union's president from their ranks. It has always been our contention and conviction that, given a man possessed of the requisite personal qualities, with a lengthy career of hard and efficient work as a Unionist behind him, and a sound, comprehensive educational and professional programme, neither his *grade* nor the *locality* of his labours should be a bar to the realisation of his ambition. The forty-five thousand members of the Union will, almost immediately, have to decide whether Mr. Muscott is the "man of the hour." He has had considerable experience of Executive work, for, under the old system of election, he was successful from 1890 to 1897. The South Midlands electoral district (where he resides) has, however, a plethora of strong candidates, and for five successive years Mr. Muscott has appealed in vain for election. He is undoubtedly "in daily contact with the difficulties of rural schools—insufficient staff, extraneous duties," and the like—and he commenced a great work when he began to organise his rural colleagues within the Union. On several occasions he has formed part of deputations to the Education Department, uttered his protest against intolerable regulations, and suggested remedies. He has this year been nominated by the Aylesbury, Bourne, Leominster, Ludlow, Melton Constable, and Presteigne associations; and if these nominations are the measure of his support, we feel justified in concluding that his hour is "not yet."

MR. W. MUSCOTT.

MR. GEORGE SHARPLES,

the genial and popular head-master of Waterloo Road Board School, Manchester, has had as varied and diversified a professional career as the most ardent "protean artist" could desire. THE PRACTICAL TEACHER of June 1895 described both the man and his methods with loving detail, and the narrative is as interesting to-day as it was seven years ago. Ready as he was in bygone days to devote his great talents to the cause of education and his fellow-teachers, during the past five years, as member of the N.U.T. Executive, he has been more conspicuous in well-doing than ever. When we remember that Mr. Sharples was in his day a magnificent football player, the captain of the famous Bolton Wanderers Football Club, and a county player to boot, and that his interest in every branch of athletics and sport is as keen as heretofore, we are able to understand *something* of the sacrifice he has made in serving the members of the N.U.T. It is not by any means easy to say in what branch of Executive work he is most prominent. Naturally, his unique experience has made him an authority on every phase of the education question, and for the past four years he has been chairman of one or other of the Executive's Education Committees. But the professional side has his attentions and sympathies likewise, whilst it is almost impossible to find words with which to depict his noble and unselfish work for the N.U.T. charities. Mr. Sharples acted as secretary of the B. and O. Conference effort in 1895, and the cheers which greeted the magnificent £4,600 from Manchester and Salford alone still ring in our ears. As a member of the Central B. and O. Council for six years, he has given testimony of a large heart, as well as a sound head. A striking proof of the reputation he has won as a capable educationist is to be found in the fact that, when the school committee of Douglas, Isle of Man, were contemplating the erection of a higher grade school, they invited Mr. Sharples to give evidence as an "expert." Still better, they accepted his suggestions almost *in toto*. Mr. M. E. Sadler, cognisant of his prowess in another sphere of activity, sought his assistance for his series of "Special Reports;" and Mr. Sharples is the author of a valuable article in Vol. II., entitled, "Organisation of Games out of School for Children of the Industrial Classes attending Public Elementary Schools." An exhaustive list of the various distinctions conferred on him would fill too much space, so we content ourselves with saying that practically every honour save the Union's "blue ribbon" has already been his. To "paint the lily" were as useful and necessary a performance as to attempt a description of George Sharples—*the man*. With personal qualities that inspire, straight away, both confidence and affectionate regard; with a style of public speaking as forcible and convincing as it is pleasant to listen to; with the ineffable privilege of having seen two of his former colleagues (in the potent personalities of Dr. Macnamara, M.P., and Mr. Waddington) show him the way to the Union's chair, we say with every confidence that a similar honour cannot from him be much longer withheld, and that when it *is* given *the man* will not be found wanting.

MR. GEORGE SHARPLES.

THE CONFERENCE TOWN.

BRISTOL.

BY J. BARNET, CONFERENCE SECRETARY.

THE CITY ARMS.

BRISTOL is within easy communication, by means of the Great Western and Midland Railways, with all parts of the country.

Having arrived at the joint-station at Temple Meads, the easiest and most direct route to the Conference hall—the Victoria Rooms—is by means of the electric tramcar, to be found at the foot of

the station incline. As we start on our journey, we have on our left the Roman Catholic Church of the Holy Cross, which is said to possess "a small portion or relic of the true cross enshrined in a silver reliquary." On past the Temple Colston School, we soon come in sight of the "Leaning Tower" of Temple Church. This church, which is large and lofty, contains many and varied antiquities, and is well worth a visit, both for its associations and its architecture. The tower is said to be as much as four feet out of the perpendicular.

Still moving towards the centre of the city, we notice immense business establishments, and here and there an antiquated inn or an old almshouse. Bristol Bridge is soon reached. The earliest record of a bridge connecting the Somerset and Gloucestershire sides of the Avon goes back to the thirteenth century. The structure was most picturesque, with its overhanging houses upon it, and a chapel tower forming an archway in the centre. From the bridge we get a glimpse of great granaries and warehouses, as well as the masts and funnels of ships on the river. The present bridge was erected in 1768.

The statue of Samuel Morley, opposite the Church of St. Nicholas, next attracts attention. The great merchant and philanthropist was M.P. for the city for seventeen years, and the statue was erected to his memory by subscriptions from

ST. MARY REDCLIFFE (SOUTH VIEW).

over four thousand citizens. The church is chiefly of interest from the fact that the old curfew bell is rung every evening at nine o'clock.

From the end of the bridge several streets radiate. The one immediately facing us is High Street, a fine specimen of the narrow streets of the old city. Our journey takes us along Baldwin Street, a centre of busy commercial life. Here are to be found the offices of shipping firms, and the headquarters of the telegraph and cable companies, while the offices of *The Western Daily Press* are conspicuous.

Presently we reach St. Augustine's Bridge, one of the greatest improvements accomplished by the City Council in late years. The old drawbridge—a swivel bridge erected in 1868—has given place to the fine stone structure now spanning the waterway, the work being carried out at a cost of £25,000. The broad open space on the right, a kind of shrubbery or garden, a welcome addition to the breathing spaces of the city, was formed by covering over a portion of the channel of the river Froom. The enclosure is ornamented with trees and plants, and is provided with seats and a band-stand. The statues of Edmund Burke, the great statesman, sometime M.P. for the city, and Edward Colston, Bristol's great philanthropist, whose beneficent work in the western city is so well known, occupy prominent positions in the avenue.

St. Augustine's Bridge wears a very busy aspect. It is the centre of the splendid system of electric tramways, unequalled by any other in the kingdom. On the bridge itself a bronze tablet can be seen. It reads thus: "From this port John Cabot and his son Sebastian, who was born in Bristol, sailed in the ship *Matthew*, 1497, and discovered the continent of America."

The visitor now has his choice of taking a car which will convey him direct by Colston Street, past the Colston Hall, to the Victoria Rooms; or he may reach his destination by proceeding along St. Augustine's Parade, by the side of College Green, and up the steep Park Street.

By the latter route he passes St. Augustine's Church, built by the abbots of the neighbouring monastery of St. Augustine in 1480. Adjoining the church stands the Royal Hotel, the headquarters of the Executive during Conference week.

College Green is a plateau of grass intersected with walks. At the entrance stands the Jubilee statue of her late Majesty, unveiled by the late Duke of Clarence.

A copy of the historic civic cross, which now stands in the grounds of Stourhead, Wiltshire, is found in the centre of the Green. Statues of kings and queens occupy the niches of the cross.

From this spot a fine view of the Cathedral, with its restored central tower, its modern nave, and its recently-erected western towers, can be obtained.

In 1831, during the riots preceding the Reform Act, the mother church narrowly escaped total destruction by fire—the bishop's palace, on the south side, being entirely destroyed.

Inside the Cathedral, the first object to demand a close inspection is the Norman chapter house, with its semi-circular arches springing from clustered columns, and zigzag mouldings, which have been described as "one of the most perfect and noblest specimens of architecture of the Norman age extant."

The Elder Lady Chapel, one of the most beautiful of its kind, always commands admiration, and its curious sculptures merit more than passing attention. The chapel has quite recently been restored. In the south transept of the Cathedral is the monument to Bristol's most famous bishop, the renowned Butler, author of the *Analogy*, who was diocesan from 1735 to 1750.

In recent years £100,000 has been spent on the cathedral fabric, and in addition a large sum has been raised for the endowment of the bishopric, which, since its separation from that of Gloucester, has been presided over by Dr. G. Forrest Browne.

The new western tower and entrance are very noticeable on leaving the building to proceed by the Norman gateway to Lower College Green, where stands a still older Norman archway, formerly the entrance to the bishop's palace.

On the opposite side of College Green stands St. Mark's Church, generally known as the Lord Mayor's Chapel, one of the most exquisite specimens of ecclesiastical architecture in the city. Originally it was called Gaunt's Chapel, being founded by Maurice Berkeley de Gaunt in 1230.

Making our way from the chapel, we soon come to Park Street, one of the steepest trading thoroughfares to be found in England. It is the main artery connecting Bristol with the fashionable Clifton. On the left, over the viaduct, stands the Freemasons' Hall with its Grecian front. At No. 10 resided the gifted Hannah More, and her connection with this part is still recognised by a small public hall which bears her name. Still climbing the hill, we come to

Great George Street, along which one gets a glimpse of Brandon Hill, another of Bristol's open spaces.

The hill is a fine, commanding eminence, its highest point being 250 feet above the level of the river. From it we can obtain a magnificent panoramic view of the city — its many churches, its hundreds of tall chimneys, and its forest of house-tops extending for miles in all directions. The hill slopes on one side towards the harbour, and on the other towards Clifton. Its name is derived from the fact that in a by-gone age a hermit named St. Brandon dwelt there in a solitary cell called his chapel.

In 1625 Brandon Hill was adjudged by an Act of Common Council to the mayor and sheriffs, the citizens having reserved to them "the right to dry their clothes there." A legend says that this gift was due to the liberality of Queen Elizabeth, who on visiting Bristol was so struck with the ugliness of the women that she gave them this privilege as some compensation for their poverty of looks.

During the struggle between Charles the First and the Parliament the hill was the scene of a sharp engagement between the opposing forces. Two Russian guns taken at Sebastopol stand near the Cabot Tower, which was erected by public subscription to commemorate the fourth centenary of the discovery of the continent of America by John and Sebastian Cabot. On the western side of Brandon Hill is Queen Elizabeth's Hospital, more generally known as the City School, founded in 1586 by John Carr, a wealthy Bristol merchant.

At the top of Park Street there is a block of interesting buildings—the Blind Asylum, the Drill Hall of the 1st Gloucester Rifles, and the City Museum and Reference Library. The latter has been acquired by the City Council, who are about to largely extend it and make provision for a public art gallery.

Photo by] QUEEN'S STATUE (COLLEGE GREEN) AND CATHEDRAL. *[M. W. Dunscombe.*

Standing at the junction of two roadways, these are the most fashionable rooms for public assemblies in Bristol and Clifton. They consist of a splendid suite of apartments. The front, shown off to great advantage by a railed-in area, is of noble proportions and fine architecture. The portico is supported by a series of massive Corinthian columns, bearing a rich entablature, and a pediment decorated with fine classical carving in bas-relief representing the "Advent of Morning." Close by can be seen the City School of Art and Fine Arts Academy.

Retracing our steps to St. Augustine's Bridge and Clare Street, we reach the heart of the ancient city. Shortly after entering the street, St. Stephen's Church is seen on the left. Its magnificent tower Mr. Ruskin declares to be "one of the most stately gems of ecclesiastical architecture." The church was built in 1469, and is still in a good state of preservation. The tower, which is in four divisions, is about 133 feet high, the fourth tier being richly decorated, and the whole surmounted by open pinnacles and fine parapets. The interior of the church will be quite as interesting to the visitor as the exterior—the fine tracery of the rich south porch, the tombs, the pulpit with its rich carvings, well repaying a visit.

Photo by] ST. AUGUSTINE'S BRIDGE AND COLSTON AVENUE. *[M. W. Dunscombe.*

Further along, in Corn Street, stands the Exchange, a finely-proportioned building, where the corn market is held. In front will be noticed four large round bronze tables, which originally stood in the old "Tolzey Court," and were then called "nails;" hence the common phrase of "Down on the nail" when the bargain was struck and the money paid on these pillars. Three of these pillars have inscriptions, and bear the names of the donors, with the dates 1549, 1625, 1631. The eastern pillar is ornamented, but bears no date.

The street almost immediately opposite the Exchange—Small Street—contains the General Post Office and the Assize Courts. In front of the Exchange stands Lloyd's Bank, on which the carvings are numerous and

Passing along Queen's Road, with its handsome shops, the visitor soon arrives at the Victoria Rooms.

beautiful. The Council House, over the front of which is a figure of Justice, adjoins the bank, and contains, among other articles of interest, the civic plate and insignia.

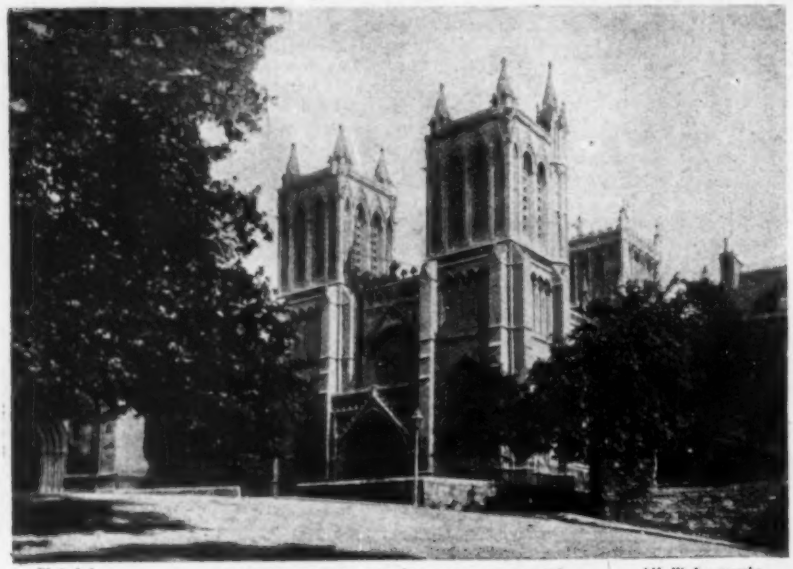


Photo by] BRISTOL CATHEDRAL (WESTERN TOWERS). *[M. W. Luscombe.*

Facing the Council House is All Saints' Church, where Colston the philanthropist is buried. During his lifetime he distributed more than £100,000 in charity.

Edward Colston was born in Temple Street in 1636. His early life is unknown, but in a letter written by himself, he asserts that he was educated in London. Afterwards he became a merchant, and in those days the Bristol quays were ever filled with costly merchandise, and its vessels flitting backwards and forwards with cargoes of untold wealth. In 1689 he went to live at Mortlake, but his connection with the city did not cease. Every year found him doing something for its poor. It was impossible for this good man to live without relieving the needy. In driving a bargain he was close to the last farthing, but in bestowing charity he was most open-handed. Colston did not wait for appeals; he went out to meet them. Several almshouses were founded by him, also the Colston School and other charities. He was M.P. for Bristol for three years; and when he was buried at All Saints' Church, in 1721, there was a solemn procession through the city.

The anniversary of his birth is still kept up by the dinners of four local societies, held annually on November 13, which perpetuate his benevolence—the Dolphin Society (Liberal), the Anchor Society (Conservative), the Grateful Society (neutral), and the Parent Society. The total collections at these functions average about £4,000.

Leaving All Saints' Church, we are now at the meeting of four streets. The Old High Cross, which we have referred to, formerly stood here; and the Old Dutch House, situated at the corner of High and Wine Streets, at once takes the visitor's eye.

At the top of Broad Street, on the right, is Christ Church, noted for the excellence of its musical services. Further along we see the Guildhall, containing the School Board offices.

The bottom of the street is spanned by an archway, over which is erected the tower of St. John the Baptist Church. The body of the church runs off at right angles to the street, and is the smallest in Bristol. It was founded about the year 1350. The nave contains the best example of the square-headed window of the Middle Ages in the city.

The tower is built upon an archway which formed one of the gateways in the old walls. On the south front of the tower there are two niches containing battered old effigies stated to represent Brennus and Belinius, who, according to legend, founded Bristol in the year 63 B.C.

Returning to the Old Dutch House, we proceed along Wine Street, in which the pillory once stood. This street has been considerably widened in later years, and is one of the busiest thoroughfares of the city. At No. 9 the poet Southey was born, and a tablet on the front of the house commemorates the event.

Before taking the turning on the left, the visitor should see St. Peter's Hospital, a picturesque building, which is very close at hand. It has been successively a sugar-house, a mint, a poorhouse, and now it is the meeting-place of the Bristol Board of Guardians.

In Union Street is to be seen the immense business establishment of Messrs. Fry of cocoa fame, founded in 1728. Over four thousand hands are employed here.

Still proceeding, we presently arrive at a large open space known as the Haymarket, where the victims of the plague of 1665 were buried. St. James's Church, on the north side, was founded by Robert, Earl of Gloucester, in 1138. The road to the right leads to Bishopston and Horfield, two of Bristol's residential suburbs.

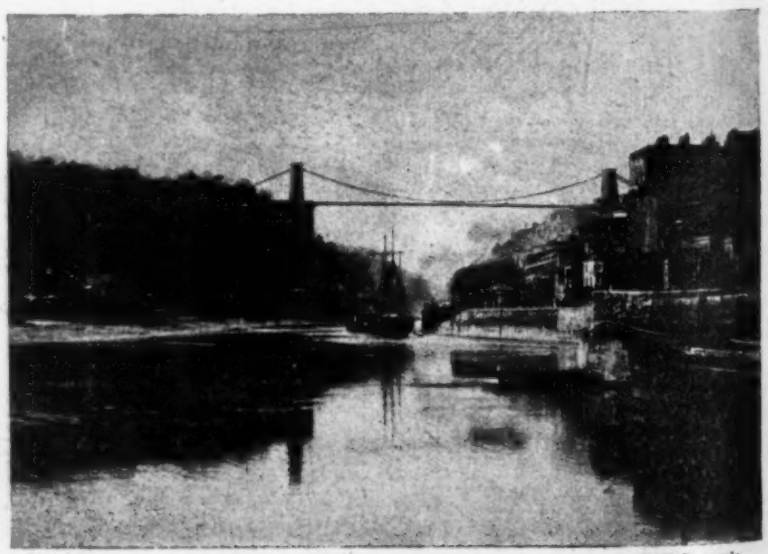


Photo by] A VIEW AT THE HOT WELLS. *[M. W. Dunscombe.*

From the Haymarket, access to the Downs, Bristol's magnificent playground, can be obtained by means of an electric

car. On our way we pass the Royal Infirmary, a large and well-equipped building, founded in 1735. Situated on Park Row is the Prince's Theatre, the largest of the local institutions which provide indoor entertainments. Bristol boasts one other theatre—the Royal—in King Street, the oldest in the kingdom.

The car speedily takes us along Queen's Road and past the Victoria Rooms, through Whiteladies Road, fringed with trees and adorned with several noticeable buildings, the chief of which are the Imperial Hotel, Redland Library, and the two centres of Nonconformity in the west—the Victoria Wesleyan Chapel and Redland Park Church. Before proceeding up Black Boy Hill, we pass St. John's Church, Clifton.

Soon the famous Downs are reached. The glorious expanse of Bristol's immense natural park stretches away on the left to the edge of the great St. Vincent's Chasm, and in the other direction to the village of Westbury-on-Trym.

These Downs are the chief recreation ground of the citizens, having been secured to them "for ever" by an Act of Parliament passed in 1861. The Clifton Down consists of 230 acres, and Durdham Down 440 acres.

Walking over the former, on which are the remains of an old British camp, the visitor arrives at the sea-walls, from which a splendid view of the Suspension Bridge and the Leigh Woods (on the Somersetshire side of the Avon) can be obtained. The bridge is 700 feet across, and 280 feet above low-water level. The structure, though fragile in appearance, is capable of supporting a pressure of 7,000 tons. It was built from the designs of the celebrated engineer Brunel, and after many vicissitudes to those who were appointed to carry out the work, it was finally completed in December 1864, Parliament's assent having been obtained and the work started in 1830. The total cost was £100,000.

Close to it stands the Observatory tower, in which is a capital camera obscura. From this building there is communication with Ghyston's Cave, a large cavity 90 feet from the summit of the rock.

From the Observatory the scenery is magnificent, woodland and plain, river and gorge, with variegated rocks of immense size, making up a most beautiful panorama which visitors never fail to admire.

The return journey can be made either by bus through Clifton, by the Cliff railway, or by descending Bridge Valley Road and taking a car at the tram terminus at the Hot Wells. These wells were once the resort of the noblest and most fashionable, who came to drink the waters.

St. Mary Redcliffe Church.

Queen Elizabeth declared St. Mary Redcliffe to be "the fairest, the goodliest, and most famous parish church in England;" and citizens, and visitors to the ancient city, have, in the years that have elapsed since the royal commendation, abundantly endorsed her appreciation.

The present church was built by William Canynge, one of Bristol's earliest merchant princes, on the site of a former one injured by lightning in 1445. It possesses a massive tower, long, tapering spire, and cathedral-like dimensions.

The finest portion of the church is the north porch, richly and quaintly carved, and octagonal in shape. A few years ago this most beautiful porch in England was restored through the generosity of a prominent citizen, who preserved his anonymity until his death.

The interior of the church, with its long-drawn aisles and fretted vault, discloses "the luxurious beauty of the interwoven tracery, flecked by fanciful bosses, literally bespangled with gold, of which, though there are nearly twelve hundred, no two are alike."

St. Mary's was put into a thorough state of repair some sixty years ago, at a cost of £50,000.

Over the north porch is Chatterton's room, with its wormeaten chests containing the manuscripts which were the inspiration of his muse.

The churchyard contains the tombs of Sir William Penn and Canynge. There is also a very old memorial to an unknown mailed knight.

The Principal Educational Establishments.

Bristol is well supplied with prominent educational establishments. University College, near the Conference hall, was established in 1876, and can boast of an uninterrupted record of successes in its four departments—(1) the Mathematical and Classical; (2) the Chemical; (3) the Engineering; (4) the Medical. The present principal is Professor Lloyd Morgan, F.R.S., and among the eminent men formerly connected with the institution have been Professors Marshall, Silvanus Thompson, Ramsay, and Hele Shaw.

In the immediate neighbourhood of the College is the Grammar School, founded in 1532 by Robert Thorne, a Bristol merchant. The present building dates from 1879, and is well equipped with chemical and physical laboratories. Although the instruction given is mainly classical, there are special departments for mathematics, science, and commercial subjects. The Great Hall contains a very fine organ, the gift of Sir W. H. Wills, Bart.

Clifton College, which is within ten minutes' walk of the Victoria Rooms, is one of the most important of the great public schools of England. As befitting its position, it is replete with every facility for the instruction of its six hundred pupils. The head-master is the Rev. M. G. Glazebrook, M.A., and under his direction the college more than maintains the great reputation it enjoyed under his two immediate predecessors.

The Merchant Venturers' Technical College, situated in Unity Street, off College Green, was erected in 1880, and is provided with a Great Hall for popular lectures and examinations, large laboratories and workshops, fitted with the latest appliances for practical work. The principal is Professor J. Wertheimer, B.Sc., F.C.S., etc., and the total number of students exceeds two thousand.

For the illustrations to this article the writer is indebted to Mr. M. W. Dunscombe, F.B.O.A., the well-known spectacle specialist and optician of 5 St. Augustine's Parade, Bristol. Visitors to Conference will find his establishment replete with special apparatus for sight-testing and spectacle-fitting. His monthly journal, *Photographic Chat*, has a wide circulation, and is sent free, on receipt of stamped and addressed wrapper, to any one interested in photography.

OBJECT LESSONS IN HISTORY.

VI.

IN this, our concluding paper, let us consider a few places not generally well known, but which possess historical interest sufficient to give data for many a lesson to the children in their neighbourhoods. It seems almost impossible to alight anywhere on a railway line in Eng'and and not to find within a few minutes of the station enough subject-matter for any local teacher's monthly history syllabus. And is it not best thus to work back from the known to the unknown, and to give as much colour as possible to immediate surroundings? The history of our old country, bulb-like, is made up of layer upon layer, of which the outer will suffice if you want only recent events; but the inner must be reached for older story, and the very centre if the germ of it all is to be studied. Even those dismal districts dignified by the title of industrial centres can be made to yield fine results to those who know how to unravel time's web, and to get at a past totally unlike the present in its wrappings of griminess and smoke.

Such thoughts as these came close together to the mind of the present writer, one day in the last summer holidays, during a journey from London northwards. And another thought came with them, which was this—how nearly equal are the chances of all English children in the matter of local history. The train had just cleared Birmingham, and had entered the heart of that district aptly termed the Black Country. If you think at all, you cannot help speculating, as you pass along, as to the effect of all this ugliness on the lives of the inhabitants; and hope comes along too with the suggestion that behind it all something may exist that can

be made to arouse the imagination of the young. Suddenly the charm you wish for is in sight, for there in the distance are the ruins of a once stately castle—a piece of objective history from which a lesson may begin, or lead back, or circle round. The veil of centuries has to be lifted, and the castle rebuilt, that it may stand before the little history learners to-day as their ancient predecessors saw it; and those ugly ironworks near must disappear back into Sussex, where they used to be when this spot was bright and beautiful, and no one yet had guessed that coal-beds were below. One can almost see the bright eyes of the group following the magic wand of the teacher as he introduces, in order of time, feudal lord and feudal serf, and nobles and knights with their ladies of high degree. And farther back still can the story run; for is not this the Mercian land to which King Alfred came, having passed through many perils by flood and forest, and forest wolves, in his journey from the south to claim the Lady Ealswitha for his bride?

LEVESON MONUMENT.

What a different England was his from ours! Then the inhabitants of one part knew less of the others than we now know of the people of China or of Peru. And how the change has come about, though a long story, is quite worth telling; and listening, the group go wandering around the castle walls, when one and another pick up some curious stones. Surely these are shellfish petrified, they say. Yes, surely they are: and if the teacher care to speak further of them, he can tell that these belong to a period far more distant than any he has yet referred to; that they are the creatures who lived here before history began, and are, therefore, known as prehistoric; and to crown the wonder, he can add that these bivalves were the local residents even before man came on the world's scene at all.

"O teacher, is it true?" one can hear them say, as a little girl said the other day when told that the coal on the fire was older than Adam. And this seemingly uninteresting district will, for these young explorers, ever after this wanderhour, wear a new face; and when they walk in it alone, many of them will feel as if admitted to a museum of which hitherto the door had been kept locked; and the power thus to read their surroundings sympathetically may help to crowd out some reading less advantageous.

But whilst the traveller's imaginings had thus been clinging round the gray stones of **Dudley Castle**, the train had been rushing on, and had brought in sight another landmark—a fine old church tower, on an eminence, to be seen from far and near. Here too must be something for the travelling teacher to see. Let him by all means alight at **Wolverhampton**, to find what local story is there afforded. His history gallery will be all the richer if he inquires his way to that church—"the old church," as it is colloquially known. But stay; there is a party just inquiring for the same, and he may share the answer. Why have they that nasal twang? Is it peculiar to this district? By no means. These are just ubiquitous Americans, like those you meet with a few miles outside the town at Boscabel, say, or still farther away, at Kenilworth. If this little detour had been made five or six years ago, your surprise would have been natural; but now that Miss Ellen Thornycroft Fowler's books are read everywhere, it is easy to understand this invasion. That talented authoress is doing for her native Mershire (Mercia) what the kailyard school have done for their land beyond the Border. Truly, as she says, "our country, bit by bit, whether poetic or prosaic, is being added to song or story." But "King's Square" is reached, and before the venerable building is entered, American and Englishman alike stand in wonder before an old monolith, Druidic or otherwise, that had puzzled for many centuries the common forefathers of them both. But here inside the porch is a tablet, intelligible even to a child. It gives an account of the foundation of this church in 996 A.D. by the Lady Wulfruna, and place-names not a few are added, which are a delight to those who love to find the originals of those in use to-day. The charter confirming this gift is now in Westminster Abbey. Inside the church it were well to borrow the eyes of the Americans; for they, like our children, have imagination in full force, seeing things ancient with a freshness that the adults of old countries can scarcely realise. Apart from its architecture, they will see many points here for a lesson. Look, for instance, to the right and left of that old stone pulpit, where stand two fearsome creatures, placed there when men believed that such ugliness would scare away the evil spirits, whom it were well to keep out of the pulpit. And very near to these is the **Leveson Monument**, a fine old brass statue, a portrait of a brave admiral who served under Drake when he chased the Spanish Armada out of English waters, thereby beginning our maritime greatness. Any boy with a taste for the sea will brighten up as he looks at this old sailor of the days of Queen Bess. Nor will he weary as he is told how, in the days of the Commonwealth, this monument was preserved by a Lady Leveson, who took it and hid it away till the Restoration.

That the soldiers of Cromwell came here, a child can corroborate for himself by reading the contents of a little memorial tablet near the pulpit. But he may as well be warned not to believe all he hears about the great Protector, whose life was certainly not long enough to do half the deeds of destruction he has been credited with; and if his soldiers were more energetic than himself, their express methods are a lost art to their representatives of to-day. But, most interestingly, the Commonwealth period here has its sequel told in marble in the little chapel opposite. There lies Colonel John Lane of Bentley, who concealed Charles the Second after the battle of Worcester, and whose sister, Jane, rode with the king on his horse, the two passing for a farmer and his wife going to market, till he was safe from the pursuit of his enemies. (See the fresco painting of this episode in the corridor between the House of Lords and the House of Commons.) The inscription on the tomb is in Latin, but the carving beneath is so literal that any child can do it into English. There, in an umbrageous oak tree, lies a crown; beneath is a trooper's horse, whose master is riding by, unconscious that above is the royal presence he seeks; and in detail are the armour and arms of the Stuart period.

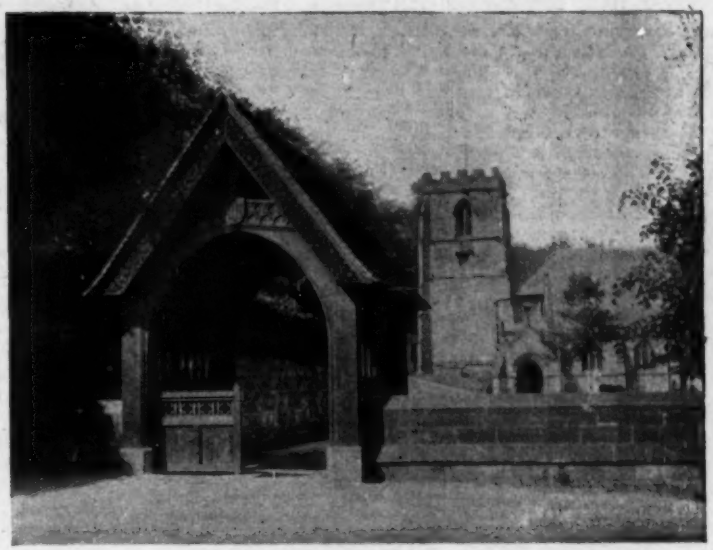
Staffordshire is pre-eminently a good county in which to teach the history of those stirring times, it espoused the Stuart cause so very warmly. There was living a few years ago, in the neighbourhood of the church, a person who continued to receive the Government pension granted to his ancestor for assisting Charles the Second at Boscabel.

And now let us, as time passes, rapidly leap from the days of the Merry Monarch to those when George the Third was king, which is rather an abrupt transition; but children who have reached so far in their country's history may be allowed to look up from the Lane monument to a little tablet with a profile in relief of Richard Fryer, who first represented their town in Parliament, and just in time to help to pass the Reform Bill of 1832, and to vote for the repeal of the Corn Laws. His beneficent life was of more use to the community than those of all the Stuart kings put together; but somehow or other, unless we can attach romantic episodes to great men, their names soon cease to be remembered. Whoever frequently visits churches and cathedrals will almost certainly come to believe that the world knows nothing of its greatest men. Cannot we as teachers make the story of how we obtained a cheap loaf as

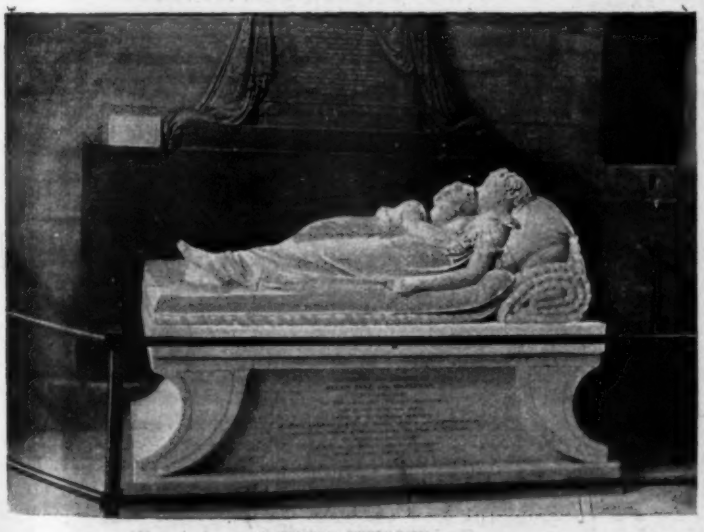
pleasing to our scholars as how a king burnt a cake? In this town the materials for such teaching are specially near to hand; but the visitor who has his train to catch by-and-by must hasten on, and out of the old porch, where is a characteristic epitaph by that best-known Staffordshire man, Dr. Johnson. And now once more in the stream of modern industrial life, either child or adult who has learned the lesson of the church feels an increased appreciation of the continuity of history, and of the responsibility of citizenship. Looking from this high ground of the market-place, there rises in the direct distance the Wrekin Hill. What fine spots that and this for the beacon lights of old times! How fitted to announce the Armada and other troubles to those whose tombs have been seen within the old church!

The children of the villages near can easily walk into this town for a lesson on these points; but there is one village close by that has its own rich local vantage. This is Tettenhall, about two miles to the westward —a beautiful spot, with a church dating from pre-Conquest times. The tumuli near cover the remains of Saxons and Danes who in 910 A.D. fell fighting for the mastery of the land. The modern mansion known as Dane's Court is supposed to stand on the site of the battle. But those old churchyard yews are better than anything else, for they still live, and in their dark-green beauty to-day are as much part of the place as when they looked on the Romans making that old road yonder. And they have been so venerated by the inhabitants of these parts from time immemorial, that one is glad to see the cousins from over the water attracted here by Miss Fowler's clever description of them. And there, not far away as the crow flies, is Boscabel, with another tree of great repute: it is the scion of that royal oak which played the chief part in the Restoration.

Staffordshire, as was said before, is rich in Stuart history; and if the tourist teacher wishes to see more of the plant ready to the hand of his local *confrère*, he will not regret visiting Lichfield before quitting the county. Soon after leaving the Black Country, "those ladies of the plain," as the three beautiful spires of Lichfield Cathedral are called, strike his view. Alighting at the city station, he will see



TETTENHALL CHURCH AND LICH GATE.



SLEEPING CHILDREN.

some Americans again, for they worshipped at this shrine long before they added Wolverhampton to their classic ground. And such visitors generally have an intelligent method in their search: if you follow them here, you may find perhaps their quest falls into three divisions — the modern or Dr. Johnson's period, the Stuart fighting times, and the cathedral or mediæval. Beginning with the first of these, they take perhaps the museum, the house in which the great moralist was born, where are mementoes enough to satisfy the most Boswellian of them all. No wonder, they say, the sage drank so much tea, if those little handleless cups were those he used. And no wonder the young bloods of his day kept clear of him in his nocturnal wanderings in Fleet Street, if he habitually made that big silver-headed stick his companion. And what a shabby little desk is that on which he wrote the pages of *The Rambler!* With a parting glance at his little breakfast-table, his easy-chair, his autograph in the great book that served him as "a book of words," the party will doubtless descend to the market square, where is being held a sale much smaller than that at which the boy Johnson looked from these same windows before which now stands his monument. A few hundred yards away is Dame Oliver's school, where, in 1714, she who could read "black letter" taught little Sam the alphabet. Poor old lady! how easy it is to conjure up her presence, and to see her standing at her door watching that no harm should come to the short-sighted child; and, a few years after, to follow her crossing the square with a parcel of ginger-bread in her bag as a present to her old scholar, who to-morrow is to be entered at Oxford. And there is to be seen the Grammar School, where not only Johnson was a pupil, but also Addison and Garrick. The house of Erasmus Darwin, too, stands as it stood when the latter was born, so nearly opposite. Both the learned doctor in whose brain the germ of the evolution theory then resided, and the little boy whose death was to "eclipse the gaiety of nations," walked in the Cathedral Close, and knew the story of the then somewhat recent siege, as the guide books tell it to-day. The cathedral then was almost destroyed, and that it is as good as ever now, and the best specimen of the Decorated style we possess, is due to the exertions of a good bishop and a patriotic people. Within its walls history-teaching can go on apace. Here is an ex-

ample of a seventh-century manuscript—it is the gospel of St. Chad; and there are ancient glass and a minstrel's gallery. In that side chapel the last English heretic was condemned to the stake; and by this pulpit preached one of the seven bishops who opposed the tyranny of James the Second.

From those bad old times it is a relief to turn to better, by making a stop before the tablet in memory of Lady Mary Wortley Montagu, that new woman of her day who introduced inoculation for smallpox into England by submitting her children to it, thus paving the way for a favourable reception to vaccination.

But the final resting-place for the eye in this cathedral, especially for a child's, should be Chantrey's masterpiece, the "Sleeping Children." Was ever sleep more livingly portrayed than on the face of the younger sleeper? Only a hint or two are necessary for the elucidation of their story; and to help children to read out of marble what a great sculptor has put into it, is to give a new pleasure to them.

But the limits of this paper are now reached; and in concluding with it our series of object lessons in history, the writer takes the opportunity of thanking those correspondents whose interesting communications show plainly that the rural teacher, though he may be obliged to go further afield for his concrete history lesson, has no great reason to envy his brethren in the large towns.

CHARACTER-TABLES.

BY JOHN ADAMS, M.A., B.SC.

THERE are three main shades of meaning attached to the word "character." The first is that of a good reputation. To the domestic servant, who on leaving her place demands a *character*, this seems the only possible meaning. Then there is the phrase "a man of character." Here the implication is mainly that of marked individuality—not necessarily the possession of good qualities, but merely of qualities that strongly differentiate the man from his fellows. Villains are very frequently men of strong character. The third shade of meaning occurs in speaking half affectionately, half scornfully of those people who have outstanding peculiarities, not of a dangerous kind, as "characters."

Psychology must take a more definite view. Our mode of reacting to the various stimuli is the fundamental test of character for the psychologist. M. Ribot demands two qualities to constitute a character—unity and stability. All the parts of a man's nature must work together, otherwise his personality falls to pieces. Further, the action taken by the united parts must have a certain amount of uniformity. It does not follow that there must be no breach of unity, or that absolute uniformity must be maintained. The differences in character consist precisely in the amount and kind of the fallings off from the standard of perfection. Yet all people who live usually and legitimately outside of the madhouse react with a marked degree of uniformity to the various stimuli of life. The most wayward and capricious people act according to fixed laws. The fact that we so often fail to discover these laws in no way disproves their existence.

"A man of known reactions" is practically a definition of a man of character in the psychological sense. At first sight it appears as if we thus deprive a man of his freedom of action, in return for his title to character. If we can predict how a man will act under given conditions, it does seem as if we had gone far to reduce him to an automaton. But consider why we are able to foretell his actions: under whose compulsion does he act? He acts thus and thus, and can none other, but why? Is it not because he is what he is? He is his own limitation: the compelling force comes from within. When we predict his actions, we are merely stating our view of his character.

The physical basis of character is temperament, and with temperament the teacher cannot interfere. But while we may not meddle with the foundation, it is our business to build upon it. Professor Queyrat defines character as "a crystallisation of habits round a central nucleus, which is the primitive temperament." It is with these habits that the teacher must concern himself. We are here unexpectedly brought face to face with the old philosophical squabble about virtue and a bundle of good habits. With that we need not trouble ourselves. Since the teacher can influence habits and cannot influence temperament, he must give all his attention to habits, and to temperament only in so far as a knowledge of it helps him to modify habits.

We have already looked at some of the classifications of temperament. Character classifications are equally interesting, and from a teacher's point of view even more valuable. Some writers, indeed, give but little help. There is something pathetic in the *naïf* arrangement adopted by Dr. Azam. We are all either (*a*) *good*, or (*b*) *bad*, or (*c*) *good or bad according to circumstances*. He has a good deal to say that is very ingenious; but after reading his book, our conviction remains that his last class is sufficiently wide to include humanity.

Taking the degree of *motility* as standard, M. Perez finds that there are really six classes of characters—the quick, the slow, the eager, the quick-eager, the slow-eager, the balanced. Here the classification is obviously too much limited to the mere temperament to be of much service to the teacher. M. Ribot, again, reduces considerably the value of his own classification by laying aside certain characters as irregular. What he calls the *amorphous* and the *unstable* make up a large part of the body of characters with which we are called upon to deal. It is indeed with these two classes in particular that the educator finds his main difficulty. His work should consist largely in raising these classes into the ranks of those who have a real character, as that is understood by Ribot. Dr. Fr. Paulhan has an admirable treatise on the subject, but unfortunately it demands a knowledge of his elaborate system of association which we are not entitled to assume on the part of our readers. Its defect from the teacher's standpoint is that it does not sufficiently recognise the part that intelligence has to play in the work of developing character. This defect is removed in Fouillée's classification, which is threefold, according as one or other of the three essential elements of character—the sensory, the intellectual, and the voluntary—predominates. It is important to note that the three main heads must get the chief consideration in any attempt to place given characters in the given scheme.

1. **Sensory** elements predominating:—
   - (*a*) With little intelligence and little will. It is difficult to find examples of this kind, since the very nature of the persons makes it unusual to chronicle their doings. Dora Spenlow, in *David Copperfield*, and Amelia, in *Vanity Fair*, may serve our purpose.
   - (*b*) With strong will but little intelligence—Joan of Arc, and the Casabianca who stood on the burning deck.
   - (*c*) With little will but much intelligence—Leigh Hunt, Lady Jane Grey, and Sentimental Tommy.

2. **Intellectual** elements predominating:—
   (*a*) Intellectuals pure and simple—Kant and Leibnitz.
   (*b*) With well-developed sensory elements—Samuel Taylor Coleridge and Goethe.
   (*c*) With will strongly developed—Carlyle and Socrates.
3. **Voluntary** elements predominating:—
   (*a*) With poorly-developed sensory and intellectual elements—George the Third of England, and William de la Marck (the Boar of Ardennes).
   (*b*) With much sensibility and little intelligence—Malvolio, King Saul, and Roderick Dhu.
   (*c*) With much intelligence and little sensibility—Von Moltke, and Louis the Eleventh of France.

There could be no better exercise for a teacher than to sit down with this table of characters and his class register, and try to arrange all his pupils in their proper places. No doubt there will be great difficulty in allocating to each his niche. Scores of questions will be raised about each. The table will be found to have no suitable compartment for some of the pupils, and for some of the compartments there will be no pupils. It is unlikely, for example, that there is any "purely intellectual" child in an ordinary class. But the very difficulties are advantages. So soon as the teacher begins to consider whether John Smith has the sensory or the voluntary elements more strongly developed, the chances are that John is on his way to be better known than he has ever been before.

Filling up schemes of character is a quarrelsome business; and not the absolute results, but the process and what may be called the by-products, are important. It is with great diffidence, for instance, that the examples have been added to the above list. Without doubt most of those who read them will have a different idea of the place of at least one or two of them.

There is a certain danger in supplying people with these lists of characters, since there is a strong tendency to apply them at once to one's own circle of friends. With our enemies we have little difficulty. They find their natural place in Class 3, (*a*) or (*b*)—the first of which are labelled by Fouillée as pig-headed, obstinate people; and the second as violent, passionate people. Wherever we fear our own likes and dislikes as disturbing forces, we had better fall back upon Queyrat's form, where there is not the same demand for *pure* types, which, as the better writers are never tired of telling us, "are rarely if ever found." All the same, for broad classifications it is well to begin with Fouillée's table. It may be used by the pupils as well as by the teacher, though of course in a quite different connection.

An excellent lesson for an advanced history class, for example, is to give the pupils the above table, and then call upon them to place say a dozen of the personages whose lives they have been studying. Experience has taught that the fault invariably made is that the subordinate heads get more attention than the main heads. Accordingly it is much better to begin with only the three main heads; and after familiarity with them has been gained, the further exercise may be given of subdividing the revised results of the broader classification.

Of the dangers of such a system of classification no one is better aware than the writer, and a future article may be devoted to this very subject. But in the meantime it may be pointed out that an excellent corrective is to adopt one or two different forms of table. The differences will prevent that terrible feeling of finality which too often marks the placing of a man in his proper compartment.

Queyrat makes out twelve distinct classes of characters, as under:—

1. Those marked by the striking predominance of one faculty or tendency—(*a*) **Emotionals**; (*b*) **Actives**; (*c*) **Meditatives**, or **Intellectuals**.
2. Marked by the simultaneous predominance of two faculties—(*a*) **Active-Emotionals**, or **Passionates**; (*b*) **Active-Meditatives**, or **Voluntaries**; (*c*) **Meditative-Emotionals**, or **Sentimentals**.
3. Preponderance of a different tonality of the three faculties—(*a*) **Balanced**; (*b*) **Amorphous**; (*c*) **Apathetics**.
4. Irregular and intermittent exercise of one of the different tendencies—(*a*) **Unstables**; (*b*) **Irresolutes**; (*c*) **Contrariants**.

This classification owes its main value to the introduction of two types that are of special importance to the teacher—the Balanced and the Contrariants. Almost every class register contains the name of at least one Contrariant, and for him the scheme of Fouillée makes no provision. The Balanced, on the other hand, has the great merit of being the type of character towards which the educator should aim. On the one hand we must remember that it is neither possible nor desirable to reduce all our pupils to the same character; on the other, that if we do not have an ideal, we shall probably wander a great deal in our efforts to modify character. If, therefore, we set out with the intention of letting all the tendencies that make for good have a fair chance, we may succeed in providing the right kind of exercise at the proper time, and thus allow the best that is in our pupils to come out.

We must encourage all the weaker tendencies to good by giving them opportunities for exercise, while we keep the stronger tendencies—even when these are admirable in themselves—in the background, by denying them opportunities. This we must do, not in the hope of extirpating the strong, but in order to produce a better balance of all the tendencies.

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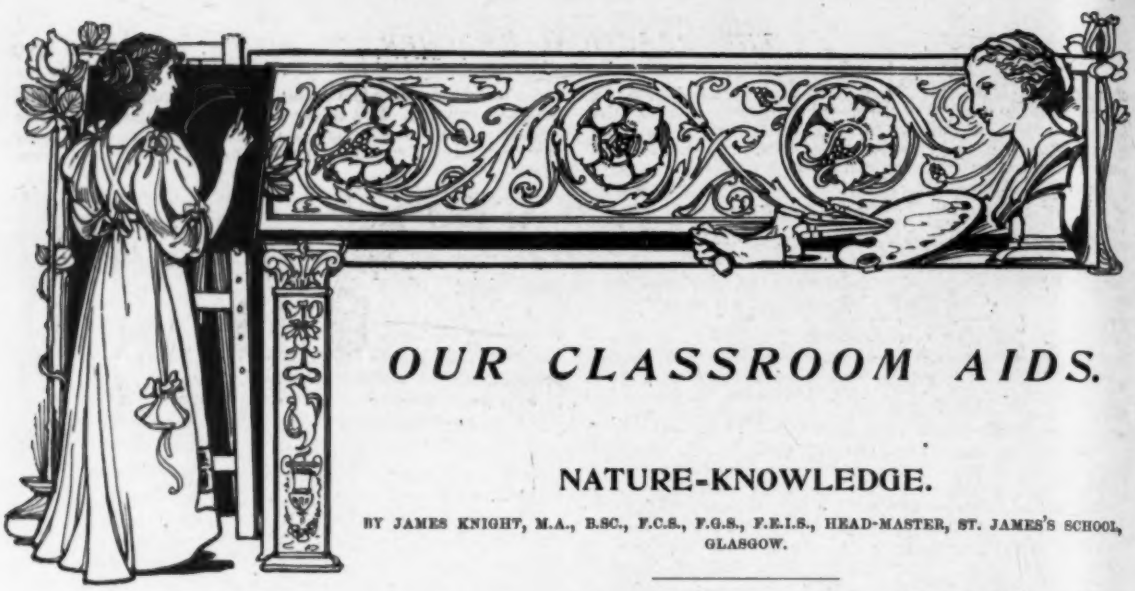


OUR CLASSROOM AIDS.

NATURE-KNOWLEDGE.

BY JAMES KNIGHT, M.A., B.SC., F.C.S., F.G.S., F.E.I.S., HEAD-MASTER, ST. JAMES'S SCHOOL, GLASGOW.

PLANT LIFE: STEMS—(*continued*).

THIS paper deals with special forms of stem—as climbing, floating, procumbent, weaving—and also with the mechanical arrangements for supporting the stem under varying conditions.

Take any long grass, such as a stalk of wheat or oats, and observe how the stem is thickened at certain points. These are the nodes or knots; and on splitting open the bottom stem of such a grass, the nodes will appear solid. From these the leaves arise, and in branching stems the branches spring from the angle between the leaf and the stem. This may be illustrated by mint or garden balsam. The latter plant, indeed, which is apt to become a garden pest, is very useful for class demonstration, on account of its size, and the variety of points it offers for study. Try to get a stout tree-twig with minor branches springing from it, and by a neat cut show that these branches arise from near the surface, unlike the branches of roots, which spring from the centre. When any trees are being cut down or lopped in the neighbourhood, secure a biggish branch, and make a series of saw-cuts, so as to prepare typical sections for the school museum.

Sometimes the main axis of a plant grows continuously, and the side growths are scanty; in other cases the main stem ceases growing, at least with the same speed, and then the side shoots become much more prominent. This gives us our first type of climbing stem, those *weaving stems*, as they may be called, which are so useful in making quickset hedges. Observe what happens in the case of a wild rose, bramble, or any natural hedge. Long, thin shoots spring up vertically in the spring, finally bending over by their own weight so as sometimes to touch the ground again, as in brambles. During the summer these become woody, and further growth in length is arrested; but side shoots spring out at right angles, generally ending in thorns or spines. A thorn, by the way, is a modified shoot, often a leaf-bud arrested in growth. It is a genuine stem, and is not to be confounded with prickles, which, like hairs, are merely surface growths, and strip off with the skin or bark. The phrase about roses and thorns may be good sentiment, but it is bad botany: roses have prickles, not thorns, as may be seen by peeling a rose branch. During the winter the woody shoot survives, and next spring fresh branches spring from its horizontal portions, again rising vertically upward; and so on, season after season, until the plant has so thoroughly woven its stems in and out among its neighbours, and even its own growth, that isolation of the plant is impossible without uprooting all around. It is needless to mention that both thorns and prickles, as well as the stiff recurved hairs which are often found on such stems, are useful for climbing and catching hold. Take a bramble stem and observe the direction of the hooked prickles, which act so as to offer no obstacle to the ascent of the stem, but immediately resist any attempt at slipping down. Stroke with the finger the trailing stem of Robin-run-the-hedge, first from top to bottom—no resistance is felt, nothing but a rough velvety pile; then from bottom to top—the finger at once catches. Do the same with a hop stem, and observe the difference, corresponding to the different shape of the hooks.

The hop is a good example of a *twining stem*. In this case the stem supports itself by twisting round some vertical support, though in many cases its action is assisted, as in the hop, by hooks, suckers, aërial roots, etc. Honeysuckle and convolvulus furnish examples of naked twining stems, which act simply by clasping their support, as a boy climbs a pole. It is interesting to watch a young hop plant. At first it grows vertically upward, but its weight soon becomes too much for the weak stem, which accordingly bends over at the top. On a warm sunny day this tip slowly swings round, like a switch held by one end and waved in a circle, as if feeling for some support, such as a vertical string or post. If such a support is found, the stem fastens itself by means of the hooks, while the tip makes several revolutions to get a firm hold. This circular feeling motion of the hop tip is fairly rapid, making one revolution in about 2¼ hours, while the common convolvulus or bindweed describes a circle in 1⅔ hours. Francis Darwin makes a clock out of it by arranging a circular sheet of paper or cardboard so that the stem springs from a central hole, and the revolving tip acts like a minute-hand. Notice, by the way, the direction in which these twining plants turn. The hop and the honeysuckle turn to the right, like the hands of a clock—that is to say, their route from west to east is by the south, WSE.; others, again, such as the convolvulus and the scarlet-runner, turn to the left, or against the clock, their route being WNE. Unwind a piece of hop stem and purposely reverse its curve, and you shall find that the plant resents this interference, and takes the earliest opportunity of correcting the mistake. It is, in short, hop nature to twine to the right, and convolvulus nature to twine to the left, and there's an end of it.

Sometimes, as in ivy and honeysuckle, the stems are lignified, so that they last through the winter. Now a lignified stem does not increase in thickness very fast; so that if it happens to be curled round a young and rapidly-growing shoot, this latter will be choked and die, unless indeed, as sometimes happens, it also twists so as to get greater elbow-room. The pupils may have seen walking-sticks illustrating several outcomes of such a struggle. One may show both prop and twiner in position—a double stick, as it were. Another may show the prop only, the twiner having died or been removed, but still leaving traces of its action in the constrictions and twistings produced in the supporting stem. Lastly, though not so commonly, fancy sticks are to be seen, in which the prop has been choked and then destroyed or removed, leaving the twining stem alone as an open spiral.

A third method of climbing is illustrated by such plants as the pea, clematis, Virginia creeper, passion-flower, etc.—namely, by means of *tendrils*. Take a common pea plant and look at the leaves. They are pinnate—that is, arranged herring-bone or feather fashion on opposite sides of the leaf-stalk; but instead of an end leaflet there is a long thread, straight at first, as if it were a continuation of the leaf-stalk. Allow this, however, to touch a support, preferably a horizontal one, and it curls round it pretty tightly, pulling up and straightening the whole stem

of the plant as it does so. It is interesting to compare, say, a scarlet-runner and a pea of the same height above ground—the former climbing by twining round a vertical string, and the latter pulling itself up by tendrils fastened to supports as nearly horizontal as can be got. On straightening out both plants, it is seen that the pea has the best of it, since it can reach a given height—say a yard—with a smaller expenditure of tissue. The pea affords an example of a leaf-tendril; the clematis will show how a leaf-stalk may be used as a tendril. Observe in this latter case how the curled leaf-stalk becomes extra thick, in order to stand the unusual strain. Indian cress, or *Tropæolum*, called by gardeners nasturtium, gives another example of a plant using its leaf-stalks for climbing purposes. Grapes and passion flowers climb by their flower-stalks; gourds, which often have very long tendrils, use their branches.

Veitch's creeper (*Vitis inconstans*), called by gardeners *Ampelopsis Veitchii*, is a very interesting plant, not only for the gorgeous autumn tints of its leaves, but for the peculiar sucker-like discs which are formed at the ends of the tendrils, enabling this plant to creep up a smooth wooden surface, and even on glass. It is useful to compare this with the common Virginian creeper (*Ampelopsis hederacea*), in which the tendrils end in hooks, enabling the plant to catch hold of rough-hewn stone-work in a wall. As in the case of pea tendrils, these hooks, discs, and spirals are only developed when the tendril catches a support; otherwise the tendrils remain fairly straight or decay, having failed in their mission.

A great many stems are procumbent, lying more or less on the ground, as may be seen in the strawberry, periwinkle, and

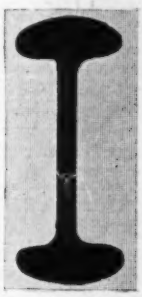


FIG. 1.—CROSS-SECTION OF RAIL.

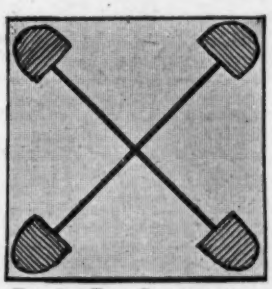


FIG. 2.—TWO GIRDERS IN A SQUARE STEM.

especially in those plants which are used for hanging baskets, such as wandering sailor, Japanese saxifrage, Aaron's beard, etc. Some of these are real creeping stems, running along the ground, as in the marsh cinquefoil and the creeping clover. A *stolon* is a procumbent stem of a year's growth, which produces buds and roots at its tips, as in bugle, hawkweed, saxifrage, purple gromwell, periwinkle, and others. A *runner* is a long, bare, thread-like stem, carrying, it may be, several buds which root and form independent plants. This is well seen in the strawberry, ground ivy, creeping cinquefoil, and creeping avens. In other cases, represented by the pimpernel and bird's-foot trefoil, the whole stem, with its procumbent branches, dies off at the end of the year, and such plants have, therefore, to propagate themselves by seeds. It stands to reason that as climbing stems need less internal supporting tissue than common erect plants, so procumbent stems, which do not take the trouble to climb, but are supported by the ground, take still less.

Stems which float on water have little or no supporting tissue, since they are borne up by the water itself. In many cases they are provided with large air-chambers, so that they are actually lighter than water, and float up to the surface when uprooted. The same thing is true of stems which are entirely submerged, such as the big oarweeds (*Laminaria*) of the sea; and if by any chance the water is removed from them by the draining of a pond or the ebbing of the tide, these stems lie flat and limp, utterly unable to support even an inch or two of their own weight. A glance at the diagrams appended will show how deficient these stems are in internal support.

Take an ordinary flat rule and bend it towards the flat surfaces: this can be done with ease. Now try to bend it against the edges: this is practically impossible. Take a sheet of note-paper and bend it in any direction; then roll it loosely round a pencil or ruler, and try to bend the open cylinder thus formed. Lastly, roll it tightly round a lead or slate pencil, and after withdrawing the pencil, as before, try to bend or break the paper cylinder. This shows that a great deal depends on the arrangement of the materials in a stem, for the amount of paper in these trials is the same. It also shows that a stem may bend

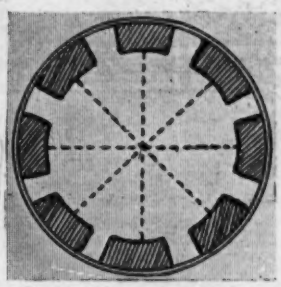


FIG. 3.—FOUR GIRDERS, APPROACHING THE RING FORM.

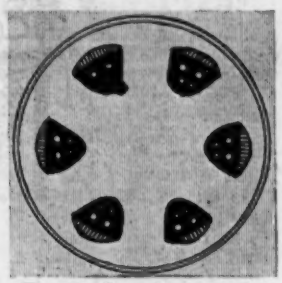


FIG. 4.—CROSS-SECTION OF LIME (*1 year*).

very readily in one direction, but be very rigid in another. Now look at a steel rail as seen on our railways. It may be bent sideways, of course, but it is meant to stand against a vertical weight, as of an engine passing over it. A cross-cut of rail gives the appearance shown in Fig. 1; and we may speak of this type of structure as a simple girder. Now apply this to a square stem, and we have a very simple arrangement of two such girders, with their flanges crossing, as in Fig. 2. If we increase the number of girders, the result may be a closed ring, as in Fig. 3, where the flanges are shown by dotted lines; and this leads up to the rings of growth which are seen in a cross-section of tree-stem.

The heads of the girders consist of what a botanist calls "vascular bundles," because they contain vessels for sap, etc. When these bundles are continued up a leaf-stalk into the blade of a leaf, we call them ribs, veins, nerves, cords; in any case they are the stays of the leaf, like the ribs of an umbrella. Now a vascular bundle consists of two parts—the wood inside and the bast outside; and in life these two are separated by a narrow space, in which the young wood and bast alike are formed. All pupils are familiar with wood, its grain and fibrous structure, shown especially in green wood; and they are fairly familiar with bast, in the form of the fibrous cords which gardeners use for tying up plants. They have now to be told that the vegetable textiles, except cotton, are woven from threads of this fibrous bast, as it is found in flax, hemp, and jute.

Figs. 4, 5, and 6 are cross-sections of one-year stems of various plants, and they explain themselves. The purely mechanical tissue is obliquely shaded, and the vascular bundles are shown in black, with white dots. Since the stems are all of one year's growth, only one woody ring is seen at most, and in some cases

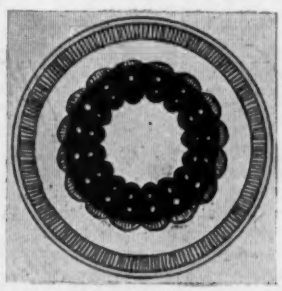


FIG. 5.—CROSS-SECTION OF STRAWBERRY STEM.

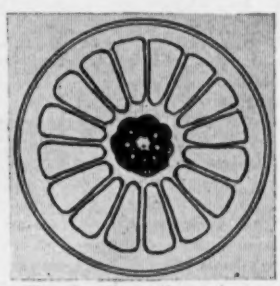


FIG. 6.—CROSS-SECTION OF WATER-MILFOIL STEM.

no ring at all has been formed. Observe especially the falling off in supporting tissue seen in the sections of strawberry and water milfoil—the latter a submerged plant, the former a creeper. Many typical sections will be found figured in Kerner and Oliver's *Natural History of Plants*, Vol. I., pp. 728 to 735, upon which the above figures have been based.

Space does not admit of touching on the uses of stems, which are, indeed, sufficiently obvious.

Coloured Supplement:
BIRD FORMS IN DESIGN.
See "Practical Teacher's Art Monthly," March.
Price Threepence.

MAP-MAKING.*

BY A. J. HERBERTSON, PH.D.

A MAP is a systematic diagram, drawn to scale, of a portion of the Earth's surface. All maps depend on determinations of relative position. On a regular surface two measurements must be made to fix the position of one point relatively to that of another. The problem of the surveyor is to do this, that of the map-maker to make a diagram of the results on a convenient scale.

Position.—The position of a point on the surface of the Earth is determined by reference to the heavenly bodies. From the altitude of the pole star or of the Sun at noon the latitude can be calculated. From the difference in time between the crossing of the meridian of a star at the zero meridian (usually that of Greenwich) and the place, its longitude is discovered. The position of the place in that latitude and that longitude can be marked on a globe or a map.

Triangulation.—A map can be made of a small area by actual measurements of distances. It is, however, unnecessary to measure more than one length. When the distance between two points, A and B, is accurately known, the position of any third point, C, visible from both, can be determined by observing the angle which C makes at A with B, and at B with A. A triangle is thus found, of which two angles and the common side are known, and from these the other sides and angles can be calculated.

The angle C = 180 − (A + B).
If we name the sides after the opposite angle,
then AC or $b = c \sin B / \sin C$,
and BC or $a = c \sin A / \sin C$.

New triangles can be obtained on both the sides whose lengths have been calculated; and so on, until a country is covered by a network of triangles whose sides and angles are known. Details of topography can be filled in within each triangle by minor triangulations, or by actual measurements with chain and tape. The measurements made can be plotted on paper on a convenient scale. This scale will affect the lengths, but not the angles. When the latitude and longitude of any place in the triangulation are determined, the whole survey can be plotted on globe or map.

Allowances have to be made for the sphericity of the Earth in calculating these triangles, when these angles should slightly exceed 180°, the difference being known as the spherical excess.

The scale used should be a "natural" one, some round fraction of the natural size—for example, $\frac{1}{1000}$ or $\frac{1}{1000000}$. The convenience of metrical measurements in mapping is very great.

Plane-tabling.—In practice much good work can be done with a simple drawing-board mounted on a camera-stand which can be levelled, and using a 12-inch ruler, with a pin fixed vertically at either end, exactly in the median line. Setting up the table at A, the ruler is turned until the two pins and B are in the same line, and a line is ruled on the paper. Similar lines are ruled in the direction of prominent objects in the landscape. The base AB is now measured, and marked off on the map on the selected scale. The plane-table is now set up at B, levelled, and aligned on A. When fixed in that position, the ruler is turned successively to all the points visible from B and previously observed from A, and lines are drawn in the directions in which these points lie, which lines cut the lines from A in points which represent the position of the places observed on the map. Angles subtended by the base which are near 60° are obviously the most favourable, and very small or very large angles are unfavourable. This also applies to instrumental triangulation.

Map Projections.—We use maps with a flat surface more commonly than globes with a spherical one. A part of the Earth's surface can be represented on a reduced scale on a globe without distortion of relative shape and distance, but not on a flat surface, unless the map is of a very small area; then the curvature may be neglected. A reference network of meridians and parallels is inscribed on a globe, and also on a map, to permit the drawing of the topography on it.

The network on a map may be quite arbitrary—for example, a series of equidistant and parallel lines for latitudes, crossed at right angles by another series of equidistant and parallel lines for longitudes, or cut by a pencil of lines passing from a point to equidistant points on one of the parallels of latitude. Maps drawn with such networks of squares and trapezia are usually much distorted, except near the equator in the former case, and when only a small part of the Earth is drawn on a large scale in the latter case.

The network of a globe can be projected on a plane. This may be done graphically by using a skeleton hemisphere and a candle in a darkened room. If the pole is in the centre of this hemisphere, the projection is a *polar* one; all the meridians are shown as straight lines passing from the pole at equal angles, and the parallels as concentric circles. When the light is far way, the outer circles are near one another; when it is at the centre of the hemisphere, the inner ones are near, and the outermost one is not shadowed on the plane at all. When the point of projection is at the centre, the projection is called *central* or *gnomonic;* when at a distance of a radius from the centre, *stereographic;* when at a distance of a chord in a quadrant still farther away, it is *equidistant* or *globular* (for all the distances between the parallels are equal); and when at infinity, *orthographic.*

When the hemisphere projected contains both poles, the projection is *equatorial*, and the equator runs as a straight line across the projection, dividing it into two equal parts. Both meridians and parallels are modified as the point of projection is moved. The parallels are straight lines parallel to the equator in an orthographic projection. Both parallels and meridians are parts of circles in a stereographic one, and all circles on a globe are circles on the map. In the equidistant projections, parallels and meridians are really sections of ellipses, but so nearly circular that, in practice, sections of circles may be used. The central projection is not much used; but all great circles on the globe become straight lines on the map.

The network may be projected on a strip of paper formed into a cylinder or cone instead of a plane, and then the paper slit, and the cylinder or cone unrolled. In both *cylindrical* and *conical* projections central projections are used. The cylinder or cone may either be a tangent or a secant to the sphere. In all cylindrical projections the meridians are parallel and equidistant straight lines; in all simple conical ones they are straight lines diverging from a point at equal angles.

There are very many "projections" that are not geometrical projections. The most important modified cylindrical projection is *Mercator's.* The meridians are parallel and equidistant straight lines. The parallels are also parallel straight lines, placed so that they are as much pulled out from one another as the parallel meridians are from the converging ones of the globe at that latitude. In this way a rhumb or loxodromic line—one which cuts all meridians at the same angle—is represented by a straight line. This is of much use in navigation, and most sea charts are drawn on Mercator's projection.

Bonné's projection is a modified conical one. The parallels are parts of equidistant concentric circles. The intersecting points of each meridian are measured along each parallel proportional to their actual distance on the globe, reduced to the scale of the network. These corresponding points are joined. This gives an equivalent projection, in which areas on the map are proportional to those on the globe.

Conventional Signs.—Boundaries are represented on a map by different kinds of lines—for example, coasts, rivers, roads, railways, outcrops of rocks, limits of vegetation areas, political or racial boundaries, etc., which may be further differentiated by using different tints on different areas. Marshes, forests, sand-bars, harbours, towns, and many other features are indicated by special signs, which are explained on all good maps.

One of the problems of the cartographer is the representa-

* This article is reprinted, by permission of the author and the publishers, from *A Handbook of Geography*, by A. J. Herbertson, Ph.D., which will shortly be issued by Messrs. T. Nelson and Sons.

tion of the third dimension on a flat map. Hills are often shown by various shadings or *hachures*, which are darker or closer where the slope is steeper, lighter and farther apart where it is gentler. The surveyor often determines in the field the position or lines—say, 100, 200 feet, etc., above sea-level. These may be mapped like the shore-line; and they give a true notion of height and a fair notion of slope, for the nearer they are the steeper the slope. They are commonly called *contour* lines. Contour or isometric lines are not confined to maps showing relief. Statistical information of all kinds can be mapped by their aid—for instance, the depth of mean annual rainfall, the mean temperature of the surface waters of the ocean, the density of population. Hence a number of terms beginning with *isos*, equal—for example, isobaths, lines of equal depth; isohyets, lines of equal rainfall; isotherms, lines of equal temperature; etc. Colour may be used to distinguish areas between successive isometric lines.

Map Reading.—A student of geography must learn to read maps. It is good practice to take the local sheet of the "coloured" one-inch $\frac{1}{63360}$ ordnance map, with relief shown by contours and also by hachures, and study every symbol on it from some hilltop, looking now at the map, now at the actual object marked. The physical, biological, and anthropological maps in this book, and all good atlases, must be studied until they become as easy to read as a simple verbal description.

Map Measurements.—The scale and projection of a map should first be examined. The scale may be measured by taking the distance between two parallels near the centre of the map, calculating the amount per degree of latitude, and comparing it with 111·3 kilometres, 69·2 statute miles, or, if an Admiralty chart, 60 geographical miles. Measurements of distances should be made on a globe rather than on a map, except where the distance is small and the map on a large scale.

The measurements of areas should be from a map drawn on an equivalent projection. The number of meshes of the network between two parallels should be counted, and the value of each mesh obtained from geographical tables. When the boundary runs across a mesh, the proportion of the mesh in one area may be estimated by using a piece of tracing-paper with finely-ruled small squares, and counting the number of them wholly, and estimating the value of those partly within the required area, compared with the total number within the mesh.

HOW TO COMPILE NOTES OF LESSONS.

BY T. HUDSON, HEAD-MASTER OF KEPLER BOARD SCHOOL, LEEDS.

V.—AN ARITHMETIC LESSON.

THE arrangement of the notes of an arithmetic lesson presents no difficulty if the teacher remembers that the mental problems, the blackboard problem and the working of it, and the test problem are all matter.

Standard IV.—Time: 25 minutes. **PROBLEM IN LONG MEASURE.**

HEADS.	MATTER.	METHOD.
Mental Work.	1. Questions on long measure table. 2. Halfpenny, 3 in. round: How far in five revolutions? 3. Halfpenny, 3 in. round: Revolutions in 1 ft. 3 in.? 4. Hoop, 2 ft. round: Revolutions in 4 yds.? 5. Two hoops, one 3 ft. round, other 4 ft.: Revolutions each in 4 yds.?	1. Give quickly. Insist on quick answers. 2, 3. Show by revolving one in front of class. 4. Give two or three similar ones quickly. 5. After the mental answer has been given, get a scholar to work it in full on blackboard.
Blackboard Problem.	The fore wheel of a carriage is 15 ft. in circumference, and the hind one 20 ft. How many revolutions will one make *more* than the other in going 20 miles? 1. 1760 yds. in 1 mile. 20 35200 yds. in 20 miles. 3 105600 ft. in 20 miles. 2. 15)105600(7040 revolutions. 105 60 60 0 3. 2(0)10560(0 5280 revolutions. 4. 7040 5280 1760 Ans.	By comparing this with 5 above, the method of working will be obtained. 1. Let the scholars do the work as the teacher puts it down. Insist on miles being brought to yards in one operation. 2, 3. By referring to the easy mental problems, this step will be obtained from the scholars. 4. Draw particular attention to the word "more" in the question, and let scholars give this step.
Test Problem.	The small wheel of a carriage is 10 ft. in circumference, and the large one is 16 ft. How many revolutions will one make more than the other in going 10 miles?	Have it written on blackboard previously. If not convenient, the circumference of the two wheels and the distance need only be written, the rest being given orally.
Correction.		Allow three to five minutes for working, then stop the class and work it on blackboard. Find *where* and *how* each sum has been got wrong.

A COURSE OF OBJECT LESSONS FOR GIRLS' SCHOOLS.

BY WILLIAM DONE, B.A.,
Head-Master of Brighton Pupil Teachers' School.

XX. MILK.

Articles of Illustration.—Some new and some skim milk; glass of water; few drops of oil; test-tube, or narrow, deep glass jar; glass bottle; tin of condensed milk; few drops of vinegar; a little sour milk; spirit-lamp; saucer.

Experiment and Observation.	Result or Inference.
Show a glass of milk. Question as to its colour, taste, etc. Compare with water.	Milk is white in colour, and is not transparent like water. It has, too, a distinct taste of its own. It feels soft if rubbed between the fingers, and will leave a stain if poured on any substance.
Take some water in a bottle, and pour a few drops of oil into it. Shake up the contents, and stand the bottle on the table.	The oil takes the shape of globules, but on standing these tiny balls of oil quickly rise to the top of the water. Oil is lighter than water.
Some hours previous to the lesson, fill a test-tube with new milk, and place some more in a saucer or other shallow vessel. Let the girls note what has taken place.	Cream has risen to the top of the milk. The cream differs slightly in colour from the rest of the milk. It is thicker in substance also. We can see this fact more clearly with the cream in the test-tube. On measuring, we find that the cream occupies about one-tenth the volume of the new milk.
Skim the cream from the milk in the saucer, pour the skim milk into a glass, compare in appearance, etc., with new milk.	After the cream has been taken off, the milk is paler in colour and thinner than new milk; it does not taste so rich, nor feel so soft between the fingers.
Place the cream in a bottle, warm it slightly, but not so as to crack the bottle; shake vigorously. Connect the fact of the globules of oil rising to the surface of water with that of the cream rising to the surface of the milk.	The cream goes into little lumps. On tasting these little lumps, they are found to be composed of fat. The cream is composed of little globules of fat, which are mixed up with the milk when it is new, and on the milk standing for some time they slowly rise to the top. Teacher will supplement this by stating that each tiny ball of fat is enclosed in a thin skin, and in shaking these globules together the skins burst, and so cause the fat to run into lumps.
Take a glass of new milk, pour in a few drops of vinegar, and filter the compound through a piece of muslin. Compare with sour milk that has stood for a couple of days.	The milk becomes lumpy, so that we can separate it into a semi-solid mass and a very thin, transparent liquid. We have got curds and whey. Sour milk that has stood for some time has a similar appearance, but not the same taste.
Show a tin of condensed milk. Let the girls suggest how it is opened. Question as to how it is used, its taste, etc.	Condensed milk is kept in air-tight tins, and is thus preserved from going bad. We do not use the same quantity as of ordinary milk. It tastes sweeter than ordinary milk. Teacher to add that condensed milk has been deprived of much of its water, and that sugar has been added. Milk in this form is equivalent to three or four times the same amount of new milk.
Refer to milk forming the sole food of infants, say for the first year of their life, and at a time when they are growing rapidly.	Milk must contain all the substances required to nourish the body. It is a perfect food.

Other Facts for Older Scholars.—The teacher might refer to the fact that milk is liable to harbour noxious germs of disease, especially if the vessels which contain the milk are not kept scrupulously clean. Outbreaks of typhoid and scarlet fever have frequently been traced to the milk supply. We know that germs of disease can be destroyed by heat, so boiling the milk before it is used is an excellent plan.

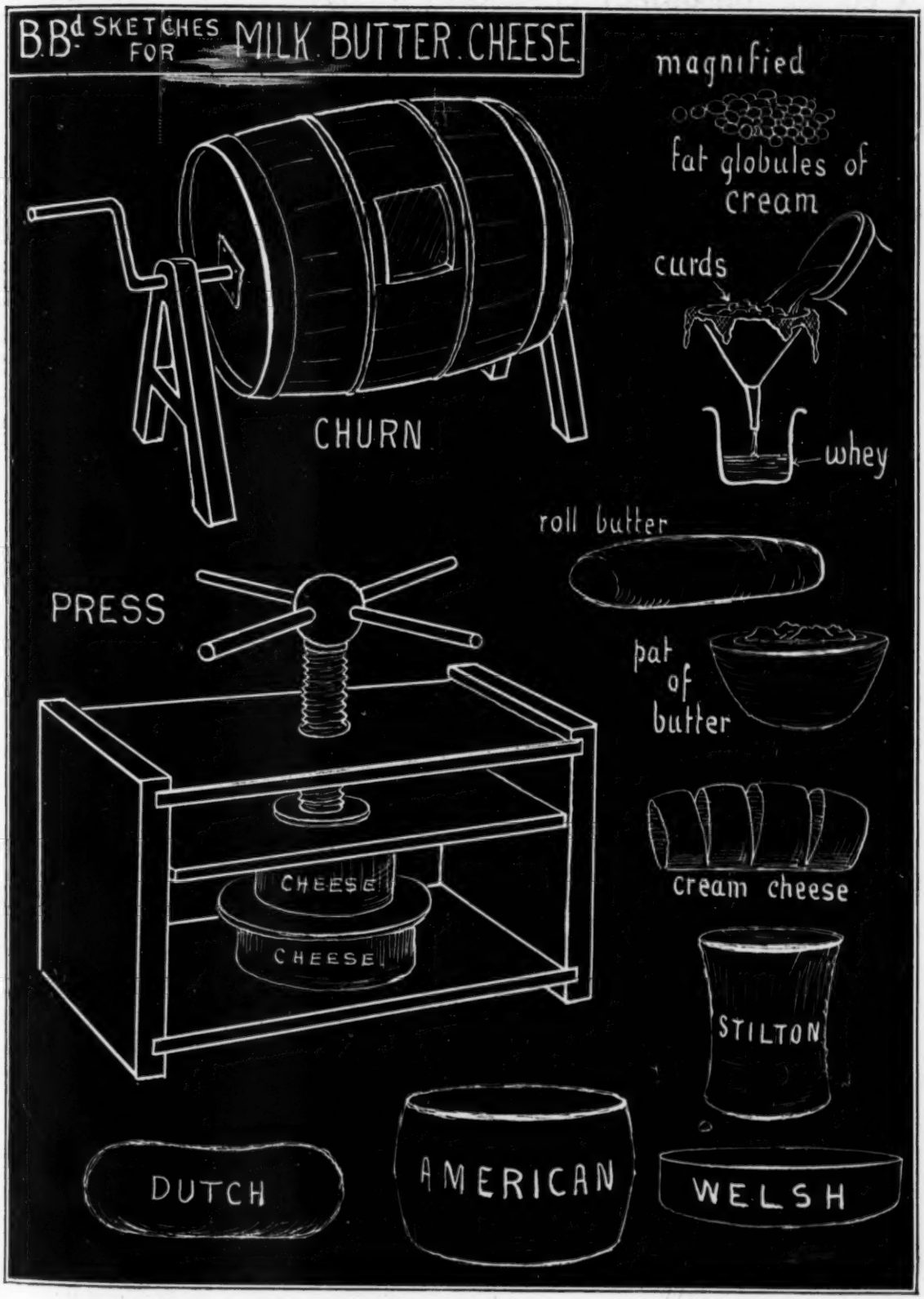
XXI. BUTTER AND CHEESE.

Articles of Illustration.—Two pints of new milk; a few drops of rennet, or one of the small tabloids from a threepenny bottle; a glass bottle; picture of a churn, or simple blackboard drawing; a glass tumbler; two shallow basins; small portions of fresh and of salt butter; small pieces of different kinds of cheese—as cream cheese, double Gloucester, Dutch; a funnel and a piece of muslin.

Experiment and Observation.	Result or Inference.
Some hours previous to giving the lesson, stand a pint of new milk in a shallow basin for the cream to rise. Skim the cream off, place it in a bottle, and warm slightly. Shake vigorously. Empty the contents of the bottle on to a piece of thin muslin, so that the fluid part runs through into a glass. Squeeze the lumps into a mass. Let some of the girls taste this. Show the fluid in the glass. Elicit that it contains all the constituents of milk except the fat. Give the name—buttermilk. Show the picture of the churn. Draw from the girls the advantages of using such a machine.	As in the former lesson, we see the little globules of fat which compose the cream have run together into small lumps, having broken their thin coverings. The resulting mass tastes like fresh butter, but it has not the yellowish appearance we usually see in butter. The buttermilk has a slightly sour taste, but from its composition we see that it forms a nourishing food. The cream can be stirred more easily and regularly by means of a churn, and larger quantities can be dealt with.
Contrast again the butter as made in the bottle with some obtained from the dairy.	The dairy butter is firmer; some is salt, and whether fresh or salt, is yellower in appearance. Teacher to tell the girls that the yellow colour is generally produced by adding a harmless colouring matter—annatto—in order to give the butter a rich appearance.
Refer to our squeezing the little lumps of butter into a mass. What other things were observed at the same time?	Besides getting a mass of butter, we squeezed fluid out—that is, the buttermilk—and the more this is done, the firmer will the mass become.
Call to the girls' minds that the buttermilk had a slightly sour taste. It very quickly goes bad. Ask why salt is added to the butter, and refer to the fact that salt butter is more used in summer.	The more the buttermilk is squeezed out of the butter, the longer the butter will keep good. Salt acts with butter as it does with regard to other food stuffs: it is a preservative, and it also improves the taste.
Take the second pint of milk; pour in a little rennet, or one tabloid of rennet. Set the milk by, to examine another time. Show a similar basin of milk acted upon by rennet some time previous to the lesson.	From the basin of milk treated with rennet previous to the lesson, we see that rennet acts upon milk similarly to vinegar: it produces curds and whey.
Filter the curds from the whey. Let some of the girls taste both. Let the class note the difference in colour, etc.	The curd is white, and somewhat resembles custard in appearance. The whey is transparent, with a slightly yellow tint. It has a sweet taste. The whey is not nearly so nourishing as buttermilk.
State that the curd contains the flesh-forming substances of the milk. Press some of the curd into a receptacle where it can drain,	The pressed curd has a taste like that of cream cheese.

BLACKBOARD ILLUSTRATION.

BY C. ARMSTRONG, ART MASTER AND SOUTH KENSINGTON EXAMINER; PRINCIPAL OF ARMSTRONG'S DRAWING SCHOOL.



Experiment and Observation.	Result or Inference.
say a thin matchbox plentifully perforated. Set it by for a few days. Now show this, and let the girls taste it. Compare with cream cheese.	Teacher to add that on a large scale the curd is pressed in moulds and salt is added, and furthermore, that cheese takes time to come to perfection, or to ripen as it is called.
¶Take small pieces of various kinds of cheese, such as double Gloucester, Dutch, etc. Compare them as regards taste.	Some kinds of cheese have a much richer taste than others. Teacher to give the reason. Some cheeses, such as Dutch, are made from skim milk; others are made from new milk.

ARITHMETIC TESTS.

Standard IV.

Card 26.

1. What is the weight of a shot in pounds, if 980 shots weigh 31½ tons?
2. £313, 15s. 7d. ÷ 318.
3. If eggs are sold at 4 for 3d., how many dozen can be bought for £2, 18s. 6d.?

Card 27.

1. Multiply three hundred and seventy-eight pounds, nine shillings, and tenpence farthing by seven hundred and eight.
2. How many weeks, etc., are there in six hundred and seven thousand and fifty seconds?
3. Three rolls of silk, measuring 96 yards, 152 yards, and 237 yards, cost £191, 19s. 7d. What was the price per yard?

Card 28.

1. How many times could 2 pecks 2 qts. be taken from a bag of flour containing 6½ bushels?
2. Reduce £8796, 17s. 6d. to half-crowns.
3. A ton of tea was made into four-pound packets and sold at 7s. 4d. a packet. How much was received for it?

Card 29.

1. Divide £407319, 17s. 10½d. by five hundred and eighteen.
2. How many half-inches are there in 7856½ yards?
3. How much can a man save annually out of a salary of three hundred guineas if he spend £3, 17s. 9d. weekly?

Card 30.

1. A boy's weekly wages are 9s. 6d. How long will it take him to earn £24, 14s.?
2. Seventy-eight pounds of mutton cost £3, 14s. 9d. What was the price per lb.?
3. If the pendulum of a clock travels 9 yards in 45 minutes, how many inches does it travel in a day?

Card 31.

1. If £53, 14s. 0½d. is divided among 173 boys, how many farthings are there in each boy's share?
2. How many ounces added to 54713 oz. will make 3½ tons?
3. A shopkeeper bought one thousand and eighty eggs at ninepence per dozen, and sold them at ten for a shilling. How much did he gain?

Card 32.

1. What is the difference in seconds between 7 weeks 6 days and 34 days 23 hrs. 38 min. 54 sec.?
2. £99, 19s. 11¾d. × 99.
3. If 35 yards 2 ft. 4 in. of velvet cost £29, 10s. 4d., what is that per inch?

Card 33.

1. What is the eleventh part of one thousand and seventy-six pounds, sixteen shillings, and tenpence farthing?
2. Find the value of ninety thousand and thirty marbles at twenty a penny.
3. A ton of sugar was bought for twenty-four guineas and sold at 3d. per lb. How much was gained?

Card 34.

1. A milkman sells 18½ gallons daily. How many pints does he sell in a fortnight?
2. If an acre of land is worth £147, 15s. 8½d., what is the value of 537 acres?
3. If a man smokes half an ounce of tobacco in a day, how much will he spend in the month of December, if tobacco is 5s. 4d. per lb.?

Card 35.

1. A tub of butter was sold for £9, 18s. 8d. If butter was 1s. 4d. per lb., how many lbs. did the tub contain?
2. Divide thirty thousand and fifty-nine pounds by six hundred and twenty-seven.
3. Lodgings at two guineas a week are occupied for 3 lunar months 3 weeks 3 days. How much must be paid for them?

Card 36.

1. Reduce half a million quarts to quarters, etc.
2. Find the cost of 679 articles at a guinea and a half each.
3. If eggs are sold at 5 for 3d., how many could be bought for £39, 17s. 9d.?

Card 37.

1. A farmer bought threescore sheep for £206, 5s. At what price must he sell each sheep to gain 25 guineas?
2. How many guineas are equal to 743904 halfpence?
3. If 18 parcels, each weighing 7 stones, were made out of 16 cwt. 39 lbs., how many pounds were left?

Card 38.

1. 19s. 11¼d. × 570.
2. How many times can I fill a peck measure from 348 qrs. 5 bush. 3 pks.?
3. If a lady gave 7½ guineas for silk at 8s. 9d. a yard, how much did she buy?

Card 39.

1. What is the value of 69 tons 17 cwt. 25 lbs., at a shilling per pound?
2. A person's annual income is £1304, 17s. 6d. How much is that daily?
3. What is gained by buying 58 yards of cloth for 24 guineas and selling it at 9s. 11d. per yard?

Card 40.

1. Reduce 187 yds. 2½ ft. 9 in. to inches.
2. What is the cost of 493 articles at £58, 13s. 10½d. each?
3. A railway train travels at the rate of 32 miles an hour. How far does it travel between half-past ten in the morning and a quarter to four in the afternoon?

Card 41.

1. £38095, 17s. 7d. ÷ 756.
2. Reduce 19 cwt. 3 qrs. 1 st. 12 lbs. to ounces.
3. A person exchanged 95 lbs. of coffee worth 1s. 8d. per lb. for tea worth 3s. 2d. per lb. How many lbs. of tea should he receive?

Card 42.

1. How many days, etc., are there in three hundred and seven thousand and twenty seconds?
2. Multiply £909, 11s. 9½d. by 909.
3. A grocer bought 5 cwt. of sugar at 2½d. per lb. and sold it at 3d. per lb. What was his profit?

Card 43.

1. Three pieces of cloth, each containing 76 yards, cost £146, 15s. 6d. What was the price per yard?
2. How many horses, worth £17, 18s. 6d. each, can be bought for £2724, 12s.?
3. How long would it take to count a million sovereigns, counting 125 each minute and eight hours a day?

Card 44.

1. How many pieces of iron, each 2 ft. 4 in., can be cut from 9 bars of iron, each 11 yards 2 ft.?
2. What is the rent of a house for three years, at 4s. 9d. a week?
3. How many minutes are there from nine o'clock on Monday morning until half-past four on Friday afternoon?

Card 45.

1. Divide £14468, 18s. 3d. by 238.
2. What is the sum of 315 half-crowns and 478 florins?

3. If a boy saves threepence a day, how many weeks will it take him to save four guineas?

CARD 46.

1. How many tons of iron would be required to make 107520 nails, if eight nails weigh a pound?
2. How much does a gentleman save out of an income of £800, if he spend £1, 17s. 3d. daily?
3. How many heaps of money, each containing a florin, a shilling, a sixpence, a penny, and a halfpenny, can be made out of £4, 3s. 4½d.?

CARD 47.

1. The cost of 38 dozen articles was £111, 3s. What was the value of each article?
2. What is the value of 18 tons 16 cwt. of coals, at 1s. 7d. per cwt.?
3. Reduce three-quarters of a million quarts to quarters, etc.

CARD 48.

1. How many farthings must be added to 5708 pence to make 28 guineas?
2. How much is 507 times £68, 9s. 3¼d.?
3. A farmer bought 46 sheep for £139. After spending ten guineas on food for them, he sold them at a gain of £23. What did he get for each sheep?

CARD 49.

1. How many stones, etc., are there in three hundred and four thousand and eighteen drams?
2. I bought 39 gross of spoons for £438, 15s. What was the cost per dozen?
3. If a man earn 35s. a week and spend 3s. 9d. a day, reckoning seven days per week, how long will it take him to save £6, 2s. 6d.?

CARD 50.

1. A farmer bought 29 cows at £17, 15s. each, and 37 horses at £19, 5s. each. How much had he left out of fifteen hundred pounds?
2. How many more ounces are there in 19 cwt. than in three-quarters of a ton?
3. What will a person receive during the last three months of the year, if he gets fivepence an hour?

ANSWERS.

CARD 26.

1. 72 pounds. 2. 19s. 8¾d., and 82 farthings over. 3. 78 dozen.

CARD 27.

1. £267972, 16s. 9d. 2. 1 wk. 37 min. 30 sec. 3. 7s. 11d.

CARD 28.

1. 12 times. 2. 70375 half-crowns. 3. £205, 6s. 8d.

CARD 29.

1. £786, 6s. 7½d., and 294 farthings over. 2. 565668 hf.-in. 3. £112, 17s.

CARD 30.

1. 1 year. 2. 11½d. 3. 10368 inches.

CARD 31.

1. 298 farthings. 2. 70727 oz. 3. £2, 0s. 6d.

CARD 32.

1. 1729266 sec. 2. £9899, 17s. 11¼d. 3. 5½d.

CARD 33.

1. £97, 17s. 10¾d. 2. £18, 15s. 1½d. 3. £2, 16s.

CARD 34.

1. 2072 pints. 2. £79360, 15s. 4½d. 3. 5s. 2d.

CARD 35.

1. 149 lbs. 2. £47, 18s. 9¾d., and 219 farthings over. 3. £32, 8s.

CARD 36.

1. 1953 qrs. 1 bush. 2. £1069, 8s. 6d. 3. 15955 eggs.

CARD 37.

1. £3, 17s. 6d. 2. 1476 guineas. 3. 67 lbs.

CARD 38.

1. £568, 4s. 4½d. 2. 11159 times. 3. 18 yards.

CARD 39.

1. £7824, 9s. 2. £3, 11s. 6d. 3. £3, 11s. 2d.

CARD 40.

1. 6771 inches. 2. £28936, 10s. 7¾d. 3. 168 miles.

CARD 41.

1. £50, 7s. 9¾d., and 544 farthings over. 2. 35808 oz. 3. 50 lbs.

CARD 42.

1. 3 days 13 hrs. 17 min. 2. £826817, 17s. 6¾d. 3. £1, 15s.

CARD 43.

1. 12s. 10½d. 2. 152 horses. 3. 16 days 5 hrs. 20 min.

CARD 44.

1. 135 pieces. 2. £37, 1s. 3. 6210 minutes.

CARD 45.

1. £60, 15s. 10½d. 2. £87, 3s. 6d. 3. 48 weeks.

CARD 46.

1. 6 tons. 2. £120, 3s. 9d. 3. 23 heaps.

CARD 47.

1. 4s. 10½d. 2. £29, 13s. 4d. 3. 2929 qrs. 5 bush. 2 pks.

CARD 48.

1. 5392 farthings. 2. £34711, 0s. 3¾d. 3. £3, 15s.

CARD 49.

1. 84 st. 11 lbs. 9 oz. 2 drs. 2. 18s. 9d. 3. 14 weeks.

CARD 50.

1. £273. 2. 7168 oz. 3. £46.

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PRINCIPAL CONTENTS.

A PORTRAIT OF HOGARTH (1697-1764) AND HIS DOG TRUMP. (From a Painting by himself.)

WELL-KNOWN PICTURES: The Marriage Settlement (Wm. Hogarth, R.A.). By W. E. SPARKES.

ANSWERS TO THE SOUTH KENSINGTON EXAMINATIONS: Design.

NEW CIRCULAR ON DRAWING: Primary Drawing. With Plates.

COLOURED SUPPLEMENT.—BIRD FORMS IN DESIGN: The Swan. By H. WILKINSON.

EDITORIAL NOTES.

WOODWORK FOR SMALL SCHOOLS. By J. SPITTLE.

EDUCATIONAL HANDWORK.

THE TEACHING OF DRAWING IN ELEMENTARY SCHOOLS. A Paper read at a Conference of the Froebel Society and the Sloyd Association, by H. TUNALEY, Sub-Inspector of Drawing.

FREEARM FOR JUNIORS.

NOTES ON MODEL DRAWING. By C. E. BELSTEN.

INTEREST IN DRAWING. By A. F. RICHARDS.

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OUR MODEL INFANTS' SCHOOLS.

VI.

THE neighbourhood in which this school is situated is in many respects a very favourable one. The inhabitants are largely of the respectable artisan and small shopkeeper class, whose interest in the education of their children is often much greater than in the case of those of a higher social rank. Irregularity of attendance, untidiness in dress and habits, etc., are largely conspicuous by their absence, while the children are both sufficiently fed and comfortably clad—physical conditions which we all know only too well have a marked influence on intellectual capacity.

The school is one of the oldest in the town, being the second built under the School Board. It has for many years enjoyed a reputation for excellence which is not diminished to-day. Five or six years ago, owing to constantly-increasing demands, the buildings of the infant department were handed over to the seniors, and a new block was built. This was laid out on most approved lines. The central hall is of considerable size, and when the partitions of two of the class-rooms are thrown back, a room almost square is obtained, large enough for any demands which may be made upon it. The hall is provided with a fireplace, as well as hot-water pipes; which adds materially to its cheerfulness. Other rooms open into the central hall, but are separated from it by brick walls, while two rooms are a little farther away, and connected by a corridor. All are lofty—more so than usual, as the building is of one story only—and are well and scientifically lighted. (It is rather remarkable, by the way, how many otherwise good buildings are spoiled with having the windows at the back.) A great deal of attention is paid to the decorations, pictures, plants, specimens, etc.; for the head-teacher is a firm believer in the indirect influence of pleasant surroundings. Lastly, there is an admirable play-ground, partly covered; while in bad weather the central hall is utilised for recreation. With such favourable external conditions, how far does the work of the school take advantage of these opportunities?

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In reading, Word-building and the Look-and-say method for irregular common words are the plans followed. The names of the letters are also taught, for convenience of reference. The head-mistress is not much impressed with many of the reading primers. The inclusion of words (because of some common syllable) which are beyond the child's comprehension, and "The fat cat sat on the mat," etc., character of the matter, were specially mentioned. She has just introduced a new set of readers, published by Dent and Co., which are a great advance on the old style. Simple fairy stories are introduced, and the books as a whole are much better than many hitherto in the market. All of us ought to impress upon the representatives of the great publishing houses the importance of this point. Of course we know the sentences are cleverly devised to introduce the words of the word-building lesson, but they tend to convert what should only be a means into an end. If a fairy tale does contain a number of unknown words, why not tell them at once? There need not be too many. I have beside me a translation of some of Grimm's fairy tales which is a model of child language. To set against the drawback of the strange words, what a gain there is in the child's interest and an incentive to further effort in reading in order to enjoy such delightful stories! Lastly, the fairy tale is real literature. I am well aware that in the earliest stages attention must be confined to common words, without any attempt at narrative; but the children can be introduced to it much earlier than they frequently are. At any rate, the head-mistress firmly believes so, and I am prepared to strongly support her opinion.

As illustrative of what I have just said, let me quote a remark of my own little girl, aged five, who was kept at home for two or three days because of a bad cold: "I do wish I could go to school this morning. We are reading about the Three Bears, and we have just got to the place where Goldilocks tastes the porridge." I may say she has only learnt to read during the last four months.

In writing, no slates are used; in fact, the slate has been abolished entirely, partly for hygienic reasons, partly because its only real value lies in the fact that it can be used again and again. In view of the cheapness of paper, such a consideration should have little weight. In the lowest classes the children write with coloured chalks on black-board cards, in the upper with coloured crayons, and finally with the pencil. The head-mistress has abandoned the round writing (which appears in the illustrations) for the oval, and finds good results are accruing. The method is a simplification of Mulhauser's.

The children bring many of the objects used in arithmetic, such as chestnuts, acorns, pebbles, shells. Gifts 3 and 4 are also used for this purpose. I asked whether it was necessary to give separate lessons on all the numbers (up to 10)—for example, 2 and 3—and I was assured that some children did not even understand what one meant, and, when asked, would bring five or six objects instead of a single one. It seemed very strange, yet no doubt we often generalise much too hastily from the few favoured children we meet with in private life, and are apt to think such simple lessons might well be omitted.

Gifts.

I found that Gifts 3 and 4 were also used to a limited extent for building. The head-mistress considered that they possessed no special value in arithmetic except perhaps in teaching halves and quarters, and that even in building they might be dispensed with without serious loss. I ventured

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The school is one of the oldest in the town, being the second built under the School Board. It has for many years enjoyed a reputation for excellence which is not diminished to-day. Five or six years ago, owing to constantly-increasing demands, the buildings of the infant department were handed over to the seniors, and a new block was built. This was laid out on most approved lines. The central hall is of considerable size, and when the partitions of two of the class-rooms are thrown back, a room almost square is obtained, large enough for any demands which may be made upon it. The hall is provided with a fireplace, as well as hot-water pipes; which adds materially to its cheerfulness. Other rooms open into the central hall, but are separated from it by brick walls, while two rooms are a little farther away, and connected by a corridor. All are lofty—more so than usual, as the building is of one story only—and are well and scientifically lighted. (It is rather remarkable, by the way, how many otherwise good buildings are spoiled with having the windows at the back.) A great deal of attention is paid to the decorations, pictures, plants, specimens, etc.; for the head-teacher is a firm believer in the indirect influence of pleasant surroundings. Lastly, there is an admirable play-ground, partly covered; while in bad weather the central hall is utilised for recreation. With such favourable external conditions, how far does the work of the school take advantage of these opportunities?

After a careful survey, one cannot fail to be impressed with the business-like air of the school. There is a thoroughness and a reality about the work, yet there is no lack of intelligent direction. The spirit of Froebel is in evidence, though not all of the appliances, and this perhaps attracted me most of all. Our schools possess a character of their own; why try to wholly change them? Surely we can assimilate the experience of other countries without losing our nationality. Here I was shown no special kindergarten so called. That was to be seen in the methods of treating all the subjects of the curriculum. The head-teacher is strongly opposed to anything of the nature of a "show." Nothing has more seriously injured the reputation of Froebel's system than the undue prominence of what I may call the *entertainment* element.

In reading, Word-building and the Look-and-say method for irregular common words are the plans followed. The names of the letters are also taught, for convenience of reference. The head-mistress is not much impressed with many of the reading primers. The inclusion of words (because of some common syllable) which are beyond the child's comprehension, and "The fat cat sat on the mat," etc., character of the matter, were specially mentioned. She has just introduced a new set of readers, published by Dent and Co., which are a great advance on the old style. Simple fairy stories are introduced, and the books as a whole are much better than many hitherto in the market. All of us ought to impress upon the representatives of the great publishing houses the importance of this point. Of course we know the sentences are cleverly devised to introduce the words of the word-building lesson, but they tend to convert what should only be a means into an end. If a fairy tale does contain a number of unknown words, why not tell them at once? There need not be too many. I have beside me a translation of some of Grimm's fairy tales which is a model of child language. To set against the drawback of the strange words, what a gain there is in the child's interest and an incentive to further effort in reading in order to enjoy such delightful stories! Lastly, the fairy tale is real literature. I am well aware that in the earliest stages attention must be confined to common words, without any attempt at narrative; but the children can be introduced to it much earlier than they frequently are. At any rate, the head-mistress firmly believes so, and I am prepared to strongly support her opinion.

As illustrative of what I have just said, let me quote a remark of my own little girl, aged five, who was kept at home for two or three days because of a bad cold: "I do wish I could go to school this morning. We are reading about the Three Bears, and we have just got to the place where Goldilocks tastes the porridge." I may say she has only learnt to read during the last four months.

In writing, no slates are used; in fact, the slate has been abolished entirely, partly for hygienic reasons, partly because its only real value lies in the fact that it can be used again and again. In view of the cheapness of paper, such a consideration should have little weight. In the lowest classes the children write with coloured chalks on black-board cards, in the upper with coloured crayons, and finally with the pencil. The head-mistress has abandoned the round writing (which appears in the illustrations) for the oval, and finds good results are accruing. The method is a simplification of Mulhauser's.

The children bring many of the objects used in arithmetic, such as chestnuts, acorns, pebbles, shells. Gifts 3 and 4 are also used for this purpose. I asked whether it was necessary to give separate lessons on all the numbers (up to 10)—for example, 2 and 3—and I was assured that some children did not even understand what one meant, and, when asked, would bring five or six objects instead of a single one. It seemed very strange, yet no doubt we often generalise much too hastily from the few favoured children we meet with in private life, and are apt to think such simple lessons might well be omitted.

Gifts.

I found that Gifts 3 and 4 were also used to a limited extent for building. The head-mistress considered that they possessed no special value in arithmetic except perhaps in teaching halves and quarters, and that even in building they might be dispensed with without serious loss. I ventured

THE CENTRAL HALL.

to suggest that, on the whole, the gifts seemed to have largely proved a failure, as they are so often misunderstood, and only used mechanically. Froebel based them on geometrical form; yet those which specially illustrate this—namely, Nos. 2, 5, and 6—are not used, and even 3 and 4 are put to other purposes. It is perhaps heresy to say so, but I believe that if the gifts were abolished entirely the schools would not suffer much, and some tedious lessons would be avoided. The head-mistress, while not prepared for so drastic a change, was of opinion that their importance was greatly exaggerated, unless children could go through them systematically, which is impossible in our elementary schools.

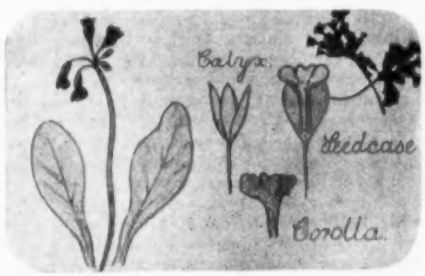
Course of Nature and Object Lessons.

1. Spring, summer, autumn, winter.
2. Chief characteristics of each month, with flowers and fruits peculiar to it.
3. Bulbs—snowdrop, crocus, tulip. (Bulbs were grown in school in each room—hyacinth and Spanish onion in plain glasses, snowdrop and crocus in pots.)

4. Primrose, cowslip, daffodil.
5. Apple-blossom, tiny apples, ripe apples. (Branches were brought to school showing apple-blossom, fruit just set, and in autumn ripe apples. These were preserved as long as possible, always before the class, and carefully examined by the children during drawing and colouring lessons of apple-blossom, etc.)
6. Swallow, cuckoo, sparrow.
7. Definition of an "insect." Insect life as shown in the life of a silkworm. (Silkworms were hatched and reared in school, examined at each stage, and corresponding lessons given. Branches of mulberry, with berries, shown, drawn; leaves afterwards pressed for future use and reference.)
8. Hips, haws, chestnut, walnut. (Branches of these were shown at each stage of growth.)
9. Evergreens, orange.
10. Fox, rabbit, squirrel.
11. Lessons to develop the idea of "soft and hard," "rough and smooth," "solids and liquids."
12. Water, milk, chalk, coal, glass, lump of clay; comparison of "salt and sugar."

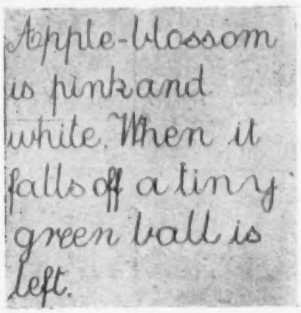
In each month flowers, leaves, and grasses (as obtainable) were gathered by the children. In the upper classes—1, 2, 3, 4, and 5—each child had a book of blotting-paper; flowers, etc., were arranged and pressed under the direction of the teacher, afterwards by children alone.

In the lower classes this was done by individual children coming out and working in front of the class, arranging flowers in large book for pressing, and afterwards mounting flowers to form designs or words marked out for them in pencil. All recitations, songs, and games, as far as possible, relate to the subject of these lessons. Time devoted to "conversational lessons" or "stories" is also utilised to further illustrate or impress the facts taught in the lessons.



The object lessons, of which the above is a scheme, are based on nature study, and though not on so elaborate and dazzling a plan as some of the schemes now put forward, show much thought and intelligence, and could be practically adopted even in very large classes. I am afraid that, if we are not careful, this latest development of object study will

become a by-word, largely because of the zeal of its advocates. We all remember the æsthetic craze, and it seems to be the fate of most good things to be exaggerated, misrepresented,



and to have much claimed for them which cannot possibly be fulfilled, and nature study is travelling along the same fatal road. I was especially pleased to find that considerations of common sense had had considerable weight here. The scheme largely explains itself. The children bring many of the flowers, others are grown in the school, and everything seems to be done to make the child observant, and to secure his co-operation wherever possible.

The correlation with hand and eye training is decidedly original, as will be seen from the illustrations. In the upper classes the flowers which are the subject of the object lesson are collected, carefully pressed, and mounted by the children.

The flowers and their parts are also drawn in coloured crayons. In the illustration the colours, of course, cannot be shown. Finally, simple sentences are written relating to the flower. In the case of the apple-blossom, pressing is omitted. In the lower classes, where the drawing is too difficult, the outline is traced and afterwards coloured. The pressing and mounting of flowers are also too advanced for the little ones; but they make a beginning by arranging the flowers, largely under the direction of the teacher, to form some outline or word. The illustration of the word "April" shows the flowers of that month arranged on this plan.

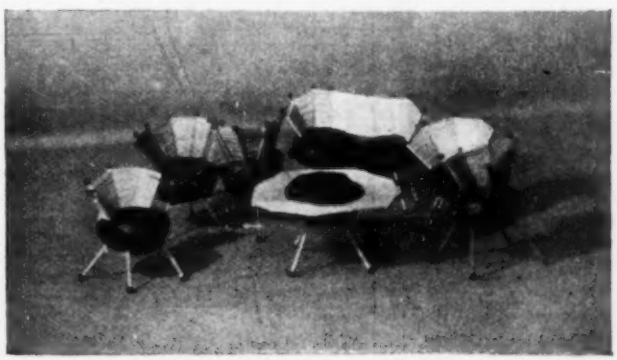
All this seemed to me exceedingly suggestive, and a very English application of correlation and hand and eye training. I strongly recommend it to the consideration of all thoughtful teachers.

The first lessons in drawing are on blackboard slates ruled in one-inch squares. The paper afterwards used is similarly ruled. The small square is rejected, because it means cramped movement, and hence more difficult manipulation. Thus another obstacle to natural development is removed. I found, also, that curves were early introduced, and that the exaggerated value of the straight line was very largely discounted here. Why, I wonder, does the official mind cling so long to such things? In most objects the curved line is much more common than the straight, and even the adult, if allowed a choice of, say, two freehand copies, one in curves and the other in straight lines, would undoubtedly choose the first. The straight line is the more difficult, so the child practises it first!

When the drawing of simple flowers and their parts is reached, then the drawing lessons follow the object lessons closely.

The colouring was entirely crayon work, so I ventured to put a query as to brush drawing. A beginning has been made during the last few months with the upper classes, but the head-mistress found the large classes and the want of knowledge on the part of the teachers rather a difficulty. Of its value she herself had no doubt, but preferred to introduce it gradually. I asked whether she thought the pencil might be dispensed with, but she was not prepared to advocate that until she had greater experience to work upon. This seems to me to be an eminently sensible plan. We have been far too ready in the past to adopt theories wholesale, even when of a revolutionary character. Many of these points can only be decided by experience, and the pencil has had first place for so long that we ought not to abandon it hurriedly. No doubt it requires more skilful manipulation and more accurate attention to detail than chalk, crayon, or brush. Further, the brush gives greater freedom of movement, much greater variety of operations, and the product is more in accord with the child's idea. Yet to say that the pencil should not appear in the infant school is certainly open to question, and experience alone can decide the dispute.

The ordinary so-called occupations are not much in evidence. Their use, the head-mistress said, was incidental rather than systematic, simply because they do not afford sufficient scope for a continuous course. In place of mat-plaiting, I was shown some very good specimens of free plaiting with broad strips of coloured paper. Paper cutting and folding perhaps received the greatest attention, because of the accuracy and skill required; but none constituted a complete course, for the reason already mentioned. I think we are beginning to realise that we must use our native inventiveness in working out the "occupation" idea, instead of mechanically adopting the old stock-in-trade. The illustration showing the furniture is a striking example of its application in this school. Silk-winding is, I believe, the technical term. The foundation is a horse-chestnut, and by using pins, a chair, a couch, a table, etc., can be produced. The silk is then woven on these pins, and the finished



product is decidedly artistic. A great deal of skill is required to turn out a good article, but the value of the exercise is ample compensation. Further, both in this and

TIME-TABLE, 1902.

INFANTS' DEPARTMENT.

MORNING.

Class.	8.55 to 9.20.	9.20 to 9.50.	9.50 to 10.	10 to 10.30.	10.30 to 10.45.	10.45 to 11.15.	11.15 to 11.45.	11.45 to 12.	Day.
I.	ASSEMBLING AND OPENING EXERCISES IN CENTRAL HALL.	RELIGIOUS AND MORAL INSTRUCTION.	MARKING REGISTERS. SONG OR EXERCISE.	Reading.	RECREATION.	Objects.	Number.	LEARNING WORDS OF SONGS. DRESSING AND DISMISSAL.	MONDAY.
II.				"		Number.	Objects.		
III.				"		"	Drill.		
IV.				"		"	"		
V.				"		"	Dictation or Transcription.		
VI.				"		"	"		
VII.				"		Objects.	Number.		
VIII.				Letters and Singing.		Number and Drill.	Recitation. Colour.		
I.				Reading.		Number.	Drill.		TUESDAY.
II.				"		"	"		
III.				"		"	Objects.		
IV.				"		Objects.	Number.		
V.				"		Number.	Objects.		
VI.				"		Objects.	Number.		
VII.				"		Drill.	"		
VIII.				Drill in Central Hall.		Writing. Recitation.	Objects. " Singing.		
I.				Reading.		Number with Money.	Objects.		WEDNESDAY.
II.				"		Objects.	Number with Money.		
III.				"		Number with Money.	Dictation or Transcription.		
IV.				"		"	"		
V.				"		"	Drill.		
VI.				"		"	"		
VII.				"		"	Objects.		
VIII.				Letter Game.		Objects. Singing.	Number and Form.		
I.				Reading.		Number.	Dictation or Transcription.		THURSDAY.
II.				"		"	"		
III.				"		Objects.	Number.		
IV.				"		Number.	Objects.		
V.				"		Objects.	Number.		
VI.				"		Number.	Objects.		
VII.				"		"	Drill.		
VIII.				Drill in Central Hall.		Letters. Words of Song.	Objects. Singing.		
I.				Word Building.		Notation and Tables.	Drill.		FRIDAY.
II.				"		"	"		
III.				"		Drill.	Notation and Tables.		
IV.				"		"	"		
V.				Drill.		Notation and Tables.	"		
VI.				"		"	"		
VII				Word Building.		"	Writing.		
VIII				Letters and Drill.		Writing and Singing.	Number. Size or Weight.		

AFTERNOON.

Class.	1.55 to 2.15.	Day.	2.15 to 2.45.	2.45 to 3.5.	3.5 to 3.15.	3.15 to 3.45.	3.45 to 4.
I.	ASSEMBLING AND MARKING REGISTERS.	MONDAY.	Girls—Needlework. Boys—Drawing.	Preparation of Games.	RECREATION.	Occupations.	DRESSING AND DISMISSAL. CLASSES I. AND II.—SPELLINGS, TABLES, ETC.
II.				"		"	
III.				"		"	
IV.				"		Game.	
V.				"		Occupations.	
VI.				"		"	
VII.				"		"	
VIII.			N. Drill. Singing.	Sand Drawing. Drill.		Words of Song. Form.	
I.		TUESDAY.	Writing.	Recitation.		Occupations.	
II.			"	"		"	
III.			"	Game.		"	
IV.			"	Recitation.		Game.	
V.			"	"		Occupations.	
VI.			"	"		"	
VII.			"	"		"	
VIII.			Occupation. " Recitation.	Singing. Picture Lesson.		Preparation of Game.	
I.		WEDNESDAY.	Girls—Needlework. Boys—Drawing.	Tonic Sol-fa.		Occupations. Recitation.	
II.				"		"	
III.				"		Occupations.	
IV.				"		"	
V.				"		Preparation of Game.	
VI.				"		Game.	
VII.				"		Conver. Lesson. Singing.	
VIII.			Sand Drawing.	Thimble Drill. Colour.			
I.		THURSDAY.	Occupation. Drawing.	Recitation. Game. Recitation.		Game. Colouring.	
II.			"	"		"	
III.			"	"		"	
IV.			"	"		"	
V.			"	"		"	
VI.			"	"		"	
VII.			"	"		"	
VIII.			K. Game in Central Hall.	Drawing on Boards.		Occupa. Card-lacing.	
I.		FRIDAY.	Geography; Conversation Lesson; Form, Colour, or Size; Occupation.	Singing.		Occupations, Story, Guessing Game, or Toys.	
II.				"			
III.				"			
IV.				"			
V.				"			
VI.				"			
VII				"			
VIII			Bead-work. Singing.	Story or Guessing Game.		Toys or Rope-pulling.	

in the mounting of flowers we satisfy the conditions of a good occupation, for *an occupation only continues to be useful so long as its various operations are of sufficient variety and difficulty to exercise the child's ingenuity and skill.*

In needlework, the younger girls, who are unable to use a needle at first, are provided with perforated cards and laces, and with these they imitate stitches. I thought this an original idea, and was assured that it had really proved a very valuable exercise, which I could well believe.

The games are sensibly connected with the object teaching. The one given below is an instance. Great care is taken not to play the same game too often, lest it cease to be play, and become a weariness instead of a delight. Here, again, I was pleased to see that another common fault had been thoughtfully avoided. I have seen games played in which the children moved in a dull mechanical way, displaying little or no interest in what they were doing, because it had become so familiar with long practice.

Play is an act, or series of acts, entered into voluntarily and with a definite aim in view, to secure exercise and pleasure. It is to the child largely what art is to the adult. Spontaneity and freshness are two prominent characteristics, and while there must be some repetition, we must take care not to destroy the most important feature of the exercise.

GAME—"SPRING FLOWERS."

Tune—"Prithee, pretty maiden."—*Patience.*

1. Flowers in a garden—red, and white, and blue;
   See, our heads are bending, caused by winds that blew.
   There have been no raindrops on our drooping heads;
   We are so thirsty, and so dry our beds.
   There have been no raindrops on our drooping heads:
   Oh, willow-waly-oh.

2. Softly fall the showers; see, we raise our heads!
   Looking, ah! so happy, in our nice cool beds.
   Pretty little daisies, pure white lilies, too,
   And the dainty bluebell—best that ever grew.
   Pretty little daisies, pure white lilies, too:
   Oo-oo-oo-oo-oo-oo-oo.

3. Gather the flowers—daisies by themselves,
   One by one the lilies, and the sweet bluebells.
   Every bunch is pretty, lovely, sweet, and fair;
   Children, like the flowers, must grow everywhere.
   Every bunch is pretty, lovely, sweet, and fair:
   Tra-la-la-la-la-la-la-la.

Arrangement.—Children arrange themselves in a circle, in which are enclosed three smaller circles of children (5) to form flower-beds, each to be named by the flowers mentioned in verse 2. Outer circle to be called a garden. A few other children to be chosen to gather the flowers when required (verse 3). Children forming flower-beds hold a flower of same name. Other spring flowers might be introduced by children playing the garden.

1. Flowers in a garden.—Children point to themselves.
   Red .....blue.—Bend heads as colour mentioned.
   There.....raindrops.—Make noise suggestive of pattering rain.
   Oh.....waly-oh.—Wave heads from right to left in a limp manner.

2. Softly.....showers.—Pat on hands.
   See.....heads.—Lift heads smartly.
   Pretty...daisies, etc.—Each circle skip round in turn as name mentioned.

3. Gather.....flowers.—Few chosen skip to flowers and gather into bunches; stay in centre; hold up bunches while the three small circles of children form one ring round. Two rings skip in opposite directions to tune of verse played quickly.

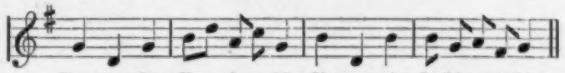
The more I see of the school, the more am I impressed with the care bestowed on every branch of work, and the intelligence in dealing with it. The elementary subjects have a prominent place; the object lessons and hand and eye training are correlated in such a way that a teacher even without special qualifications can achieve great success. The children share in all that goes on in every possible way, and remembering the class from which they are largely sprung, there is no doubt that the practical and commonsense, yet none the less intelligent, training they are receiving, is just the kind of thing which should be the real purpose of a school.

STRING: EXAMPLE LESSON.

BY C. M. A. COOMBS, L.L.A.

Apparatus.—Each child to have a piece of damp string, eight inches in length. With this material both round and angular letters can easily be made by the children. A low blackboard, entirely for the children's use, should also be provided, and a good plain sheet of large letters.

Method.—*Introduction.*—While teacher is giving a piece of string to each child, the class to sing:—



O Directly the child gets his string, he makes letter O on his desk with it.

Lesson.—Now, babies, let us open letter O's mouth.

C See, he wants his dinner! How do you feel when you want your dinner? Let us call this letter a hungry letter, then. Look which side he opens his mouth—the side pointing to teacher's pictures. You open your letter O's mouth. Who can tell its name? John is right: he calls it letter C. It can talk to us. Do you know how many sounds it has? Yes, two—a hard one, and a soft one.

Teacher pronounce as in "cat" (hard).

Teacher pronounce as in "city" (soft).

Children imitate teacher.

G Shall we give letter C something to eat? Bend the string in so. (Teacher makes little horizontal line with lower end of letter C.) There, now, it is holding it in its mouth. Who is holding it? Letter C? No; now it has a new name. Who knows it?—Grace, come and make it on my board.—Alice, come and find it on my sheet.—All say together, "Letter G; G for Good."

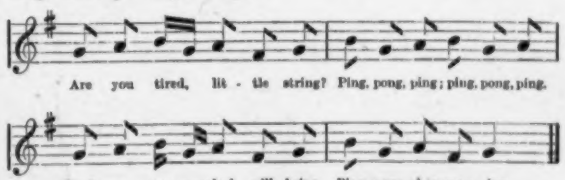
I Stretch string with two hands; put two ends together. Pinch the double part at the bottom. Make letter I on desk, with the two ends at the top. Now

V open the ends, and we have letter——? V.—Jim, come and show me letter V.—Mabel, come and make it on blackboard. Stretch string again. Make it lie down

L along the edge of the desk. Show pointing finger. Place on middle of string. Press hard, and keep it there. Show left hand; touch string. Move it till it makes letter I. Now move both hands away, and what letter have you? Yes; the letter we made with our slats the other day—letter L, with a big foot. What does it say to us?—Now for a new letter. Take up string; make it lie down in the middle of the desk.

S Look, mine wants to lift its head. Show left hand; touch the string, and make it turn round so. Now let us make pussy's tail. Show right hand; turn the string down this time. Can some one tell me its name? Yes; letter S. See how I make it on the blackboard. Who can come and draw letter S? Is it on my sheet, I wonder? Oh, Annie can see it.—Come and show us, then.

Conclusion.—Now, I think our string has done so much work it must be tired. Shall we put it into bed? Class sing, while passing string:—



OUR TUTORIAL SECTION

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Principal of the Belvedere Pupil Teachers' Centre, First on Scholarship List; Author of "Scholarship School Management," "Building of the British Empire," etc.

SCHOLARSHIP EXAMINATION, 1902.
Third Month—March.

Work for the Month.

1. *Reading.*—*Quentin Durward*, chaps. x.-xviii. (For notes, see page 478.)

2. *Repetition.*—Ten or twelve lines per week.

3. *Teaching.*—Chap. iii., *Scholarship School Management.* This chapter, on teaching aids and devices, should be carefully prepared, since it bears an important relation to all instruction, and a young teacher is frequently very deficient in the knowledge of how to apply various apparatus to a lesson.

4. *Drawing.*—A freehand copy per week, which may be sent up for criticism. For practice in the drawing of foliage, the student may well practise from nature. The Art Company, Derby, publish an excellent set of photographic studies of plants.

5. *Music.*—Chap. iii., *School Music Teacher.* Transition and the minor mode. These are subjects on which a question is nearly always set. Every one should be able to construct a modulator, placing the notes of the first two sharp and flat removes in their proper place.

6. *Needlework.*—Cutting out an overall.

7. *Penmanship.*—Ten minutes' daily practice. (Use *The Practical Teacher Copy Book.*)

8. *Spelling.*—One hundred words per week, from *Words Commonly Misspelt.*

9. *Composition.*—Write one or two essays each week on such subjects as—"Migration of Birds and Animals," "The English Character," "Sweet are the Uses of Adversity," "The Power of the Press," "A Walk in Spring," "The Difficulties of a Young Teacher," "A great Colonial Industry" (for example, sheep-farming, lumbering, etc.), "The Advantages of a Knowledge of History and Geography."

A classification of facts must be prepared before commencing to write. For instance, in taking the first subject, the sections might be:—

(1.) Migration—what it is. Examples.

(2.) Causes—not, as frequently stated, *weather*, but rather a question of *food* supply. The migratory birds are mainly insectivorous, and visit us when insects are abundant, leaving when the supply begins to fall short.

An *instinct*, not a *reason*. A young swallow, born in England and kept in a cage, shows in the autumn the same restlessness as his free companions.

(3.) Points of interest—distance traversed, rate of travelling, return to same spot, etc.

10. *English.*—

(1.) Twenty-five roots and meanings per week.

(2.) The grammar of the pronoun.

(3.) English language till the time of Chaucer.

(4.) *Julius Cæsar.*—Act II., Scene 1, to line 233, "Therefore thou sleep'st so sound."

The Pronoun.—Learn a good classification. The following might be adopted:—

(1.) Personal—I, my, me, we, our, us, thou, etc.; he, she, it.

(2.) Demonstrative—this, that, you, such.

(3.) Relative—who, which, that, what, as.

(4.) Interrogative—who, which, what, whether.

(5.) Indefinite—any, some, other, one.

(6.) Distributive—each, every, either, neither.

(7.) Possessive—mine, thine, etc.

(8.) Reflexive—self and selves in compound.

(9.) Emphatic—self and selves in compound.

Notes.—(*a*) *Ye* was once exclusively nominative, *you* objective. Now they are used for either case.

(*b*) *You* is usually used when addressing *one* person, but it must be *always* considered plural; it takes the plural form of the verb.

(*c*) *My, our, thy, your, her* may be considered pronouns in the possessive case; *mine, ours, thine, yours, hers* possessive pronouns in nominative or objective case.

(*d*) *It* is called an impersonal pronoun by some grammarians in such cases as, *It rains, It hails, It is evident that*, etc.

(*e*) *The*, in such phrases as, *The sooner the better*, is properly the instrumental case of the personal pronoun, though often regarded as an adverb of degree.

(*f*) *What* may be used in place of the two words *that which*.

(*g*) *Whether* = which of the two: "Whether of the twain did the will of his father?"

(*h*) *Any, some*, etc., are indefinite pronouns when not followed by a noun. Before a noun they are indefinite adjectives.

(*i*) The compounds of the pronouns with *-self* are only reflexive when they are governed by the verb of the sentence or by a preposition (that is, they are always objective case). In all cases the action is reflected or *bent back* on the subject. The ordinary forms are sometimes used—for example, Prepare *thee*, Get *thee* wood enough, Let every soldier hew *him* down a bough.

When *myself, thyself, himself* are used in apposition to the subject or object, they are *emphatic* and not *reflexive*—for example, I myself will do it.

(*j*) *Each other, one another* are sometimes called reciprocal pronouns.

Language.—From 1066 to 1250 is the period of contest between the Anglo-Saxon and Norman-French, toward the end of which the languages were becoming fused into one. Chaucer is the first writer who used this compound language, and hence is sometimes called the *founder* of our language. The change produced by this period of strife must be studied from the text-book.

Julius Cæsar.—(*a*) I will do *so*. *So* is usually considered an adverb, though by etymology it is a pronoun in such a case.

(*b*) *Quite* through the deeds of men. *Quite* is an adverb, modifying the whole phrase following.

(*c*) Such men as he *be*. *Be* is not in this case subjunctive mood, but an alternative form for *are*. In the Wessex dialect of the present day country people usually say, *We be, You be, They be*. This form is now generally restricted to poetry.

(*d*) The people fell *a-shouting*. *A* is here a weakened form of *on; shouting* is the gerund governed by it. It should be parsed in this way.

(*e*) Every *time* gentler than *other*. *Time* is adverbial object, so is *other*. *Than* is a comparative conjunction joining them.

(*f*) But *soft*, I pray you. *Soft* = softly, steadily; contraction of *speak softly* or *slowly*.

(*g*) As they *used to do*. *Used* governs the infinitive *to do*.

(*h*) *If you please to speak*. This must be arranged: If it (that is, to speak) please you.

(*i*) *Cæsar doth bear me hard*, etc. The meaning is: Cæsar hates me, but loves Brutus. If I were to change places with Brutus, he (Brutus) should not shake me from my allegiance to Cæsar, as I have been doing to him.

(*j*) *Woe the while* = woe be to the while. *While* is here dative case, a noun meaning *the time* or *the age*.

(Students must send up any passages on which they want assistance.)

11. *Geography.*—

(1.) Revise in detail France, Germany, Russia, Austria, and Switzerland.

(2.) Australia: physical features, climate, productions, imports, exports, etc.

The physical features present no difficulty, if map-drawing is freely resorted to. The climate is modified largely by the arrangement of the mountain system. The periodic droughts, the hot winds from the interior plains ("brick-dusters"), and the rain winds from the ocean must be noticed.

In dealing with the productions, note the peculiarities of the native fauna and flora. The absence of any large quadrupeds and of any natural food plant is remarkable, and equally so is the vitality shown by the animals and plants that have been introduced. Rabbits have been killed by millions, and are still a nuisance; thistles and watercress grow to enormous dimensions, compared with those at home. Of the useful plants, the wheat grown is second to none in quality; fruit-trees kill themselves by overcropping. The amount of land available for farming has been increased by sinking artesian wells, and by irrigation from the rivers.

NAME.	SIZE.	POP.	PRODUCTIONS.	IMPORTS.	EXPORTS.
NEW SOUTH WALES....	Sq. Mls. 310,700.	1,366,408.	*Animal.*—Horses (500,000), cattle (2,000,000), sheep (40,000,000), pigs (250,000). *Mineral.*—Gold, copper, silver, lead, iron, and precious stones. *Vegetable.*—Wheat, maize, potatoes, tobacco, sugar-cane, wine, oranges and fruits, timber.	Drapery and apparel, iron and steel, machinery, spirits, beer and ale, boots and shoes.	Wool, copper, leather, tallow, frozen meat, butter.

NAME.	SIZE.	POP.	PRODUCTIONS.	IMPORTS.	EXPORTS.
VICTORIA.....	Sq. Mls. 87,884.	1,200,914.	*Animal.*—Horses, sheep (12,000,000), cattle. *Mineral.*—Gold, tin, copper, coal, antimony. *Vegetable.*—Wheat, fruits, wine.	Cotton and woollen goods, sugar, timber, iron goods and machinery.	Wool, gold, butter, wheat, leather, skins and hides, live stock.
SOUTH AUSTRALIA.....	903,690.	362,604.	*Animal.*—Sheep and cattle. *Mineral.*—Copper, gold, silver, lead. *Vegetable.*—Wheat, barley, oats, potatoes, fruits (oranges, lemons, almonds).	Cotton and woollen goods, iron goods and machinery.	Wool, copper, butter, fruits, wheat, etc.
QUEENSLAND.....	668,497.	498,429.	*Animal.*—Sheep, horses, cattle, etc. *Mineral.*—Gold, copper, tin, lead, coal. *Vegetable.*—Fine timber, wheat, oats, barley, maize, sugar, sub-tropical fruits (peaches, pineapples, bananas), cotton, coffee.	Cotton and woollen goods, iron and machinery, spirits.	Wool, gold, silver, meat, fruit, oysters, sugar, skins, tallow, live stock.
WEST AUSTRALIA.....	975,920.	187,000.	*Animal.*—Horses, cattle, sheep, pearls and pearl shells. *Vegetable.*—Jarrah and other woods, cereals, wine fruits. *Mineral.*—Gold, lead, copper, tin.	Clothing, ironmongery, machinery, tea, tobacco, spirits, beer, soap.	Wool, gold, jarrah, karri, tin, copper, sandalwood, pearls and pearl shells, kangaroo skins.
TASMANIA.....	26,215.	172,475.	*Animal.*—Horses, sheep, cattle. *Vegetable.*—Timber, fruit, cereals. *Mineral.*—Gold, silver, copper, tin.	Clothing, machinery, spirits.	Wool, gold, silver, copper, timber, tin, fruit, sheep, frozen meat.

The gold mining is carried on mainly by companies, working with crushing machinery, and all the latest improvements in methods of extraction. There is little of the individual digging of the early days. The student should read a good description of the main industries. Queensland does some trade with China in *bêche de mer*, a large sea-slug. West Australia carries on extensive fisheries for pearl oysters. Wood is imported into the colonies, not because they are deficient in timber, but because it is cheaper to buy ready-made doors, windows, etc., from Sweden than to make them in Australia. Perishable goods—such as meat, butter, etc.—are exported in specially-constructed steamers provided with freezing chambers. The butter is of the very best quality, and is generally sold as "best English fresh," and a good deal of the "home-killed meat" sold has undoubtedly come from the Antipodes.

12. *History.*—Henry II. to Henry III. The chief points to be attended to are:—

Henry II.—Foreign possessions; quarrel with the church, and Constitutions of Clarendon; conquest of Ireland; *reforms* (most important); scutage.

Richard.—The Crusades; state of England during the king's absence.

John.—The loss of the French possessions; the quarrel with the Pope; the circumstances leading to, and the provisions of, the Magna Charta.

Henry III.—Note the three divisions of the reign: the king's minority—rule by justiciars; the period of personal rule; the rule of the barons—the first House of Commons.

As pointed out on starting the course, students must trace carefully the great movements which took place over a long period. Such movements are—the decay of feudalism, the growth of the towns, the influence of the church, the rise of the House of Commons, effects of the Crusades, etc.

Causes of the decay of feudalism:—

(1.) Scutage, which allowed a money payment instead of personal service. This was readily given by the lesser barons, who became the county gentry, and devoted their energies more to agriculture than to warfare.

(2.) By the Inquest of Sheriffs, 1170. The office was taken from the great baronial families and given to men appointed by the king, and therefore under obligation to the crown.

(3.) The rise of the towns, and the increase of wealth among the merchants. The man with money had more influence than the man with a few armed retainers.

(4.) The rise of the House of Commons.

(5.) The Crusades, which impoverished many nobles, who, to raise funds, sold their land to the merchants or the church.

(6.) The spread of education.

(7.) The Peasants' Revolt, which initiated the system of holding land for rent paid, and not on military tenure.

(8.) The Wars of the Roses.

(9.) The introduction of gunpowder into warfare.

The House of Commons.

The Anglo-Saxon shire moot was a properly-elected "county council," in which all classes were represented.

The Magnum Concilium of the Normans consisted of the prelates and *all* barons. But the lesser barons soon ceased to attend, or to be expected to attend; hence the power lay entirely in the hands of the greater barons. But as the merchants of the towns acquired more and more wealth, their assistance in the matter of taxation, and finance generally, became necessary. In 1213 John summoned to a council four representatives from each shire. In 1254 two representatives of the counties (knights of the shire) were called to the council. This was only restoring to the county gentry the right they had previously allowed to lapse. De Montfort called the first representative Parliament, the chief point about which to be noted is that, for the first time, the *towns* sent commoners. Thirty years later, Edward the First summoned the first model Parliament. It is also interesting to note that when the Commons sat in a separate chamber from the Lords, they were joined by the knights of the shire, and from this union of merchants and knights arose the great *middle* class of England. In France, the careful distinction of class—nobles and people—was continued till the Revolution.

Effects of the Crusades on Western Europe:—

(1.) As mentioned above, many barons were impoverished.

(2.) The power of the church increased, as might be expected from a holy war.

(3.) The Jews naturally became more unpopular than ever.

(4.) Commerce with the East developed enormously, and caused the rapid growth of Venice, Genoa, etc.

(5.) The absence of turbulent barons encouraged the growth of the towns.

(6.) Eastern diseases (the plague, leprosy, etc.) introduced.

Note in John's reign that the loss of the French possessions made the barons consider England as their home, and themselves as Englishmen—a feeling still further extended by the necessity for the union of all classes to withstand the tyranny of John. How do the provisions of Magna Charta show this?

13. *Arithmetic.*—The metric system; ratio and proportion.

The metric system is adequately dealt with in the text-book. The theory of ratio and proportion must be thoroughly prepared. See that the following questions can be answered:—

(1.) Define ratio, proportion, antecedent, consequent, compound ratio, direct and inverse ratio, duplicate and triplicate ratio, mean proportional.

(2.) If $a : b :: c : d$, how many equations can be made from the statement?

(3.) Need the missing term in a proportion be the *fourth* always?

(4.) What is wrong with the following?—

As 2 books : 4s. 6d. :: 3 books : 6s. 9d.
As 10s. : £1 :: 15s. : 30.

Work as many of the examples given in the text-book as time will permit.

14. *Algebra.*—Multiplication and division of fractions. Use factors wherever possible.

15. *Euclid.*—Book II., Props. 9–12, with four deductions per week.

16. *Languages.*—Finish the *Life of Miltiades.* Note the "Helps for Latin Papers," given on another page. In French, read as much as possible.

(It is found impossible to set detailed work to suit each student, but I shall be pleased to assist by letter any one who requires advice.)

17. *Elementary Science.—Heat and Temperature:* Effects of heat. *Thermometers:* Change of state by heat, etc.

18. *General Information.*—Answers to questions asked:—

(1.) *What is the cause of an echo?*—An echo is the repetition of a sound. The hearing of a sound is due to the waves set up in the air, which enter the ear, and so produce the sensation of hearing. When a gun is fired, the waves spread rapidly in every direction. These sound-waves may, if they meet a fairly perpendicular wall or rock, be reflected, and thus the sound reaches the ear twice, the second sound being called the echo. If a person were standing between two high walls, say one hundred yards apart, and the air were still, the sound might be reflected backwards and forwards ten or a dozen times.

(2.) *What are the "Chiltern Hundreds"?*—The term "Hundreds" is an Anglo-Saxon word denoting a division of a county. The Chiltern Hundreds are Stoke, Desbrough, and Bodenham. This part of the Chiltern Hills was formerly so infested with robbers that a special steward was appointed by the Crown to put them down; and the office still exists, though there is no longer any need for such an officer. A member of Parliament cannot resign his seat, and, at the same time, no member of Parliament can accept a Government appointment without thereby vacating his seat, necessitating his re-election. So that a member who wishes to give up his position applies for the "stewardship of the Chiltern Hundreds." He receives this appointment, and thus loses his seat. He then resigns the office.

(3.) *Is there any truth in the suggestion that Bacon wrote the plays of Shakespeare?*—I should say not. It was, and is, a wonder that a man like Shakespeare, who had not received the best education, should write dramas evincing such vast knowledge, but it is by no means an impossible wonder. An American has professed to find a secret cipher running through the plays attributing them to Bacon, the wisest man of his age. But there is probably nothing in the supposed discovery.

(4.) *What is the Stock Exchange?*—The Stock Exchange is a corporate body which practically has a monopoly of the buying and selling of Government stock, and, besides, carries on very great transactions in all other stocks and shares. Members have to pay a heavy entrance fee. The price of stocks and shares is continually varying, and members endeavour to buy stock at one price and sell at a higher. If they buy for the outside public, a charge is made of ¼ per cent. (brokerage) on Government stock, and varying commissions on other stock. When stocks and shares are bought and sold, long credit cannot be allowed; but settling days are held, usually in the middle and at the end of a month. Speculators who buy in anticipation of a rise in a stock are called "Bulls;" those who sell from fear of a fall in price, "Bears."

Questions for Competition. (See rules last month.)

1. When were surnames introduced, and from what were they derived?
2. Where would a person have no shadow on December 21, March 22, and June 21?
3. What are the causes of the seasons?
4. Complete the following quotations:—
   (*a*) "A little learning....."
   (*b*) "The better part of valour....."
   (*c*) "'Tis distance....."
   (*d*) "A thing of beauty....."
   (*e*) "One touch of nature....."
   (*f*) "The paths of glory....."
5. What is the Aurora Borealis?
6. "The value of our imports exceeds by £150,000,000 the value of our exports." How do you account for the prosperity of England under such conditions?
7. Why does the mercury in a barometer rise and fall? What can we deduce from this?
8. What are cyclones and anticyclones?

Questions on the Work for the Month.

(The answers to these are marked and returned for a nominal fee of one shilling.)

1. Write as specimen of copy-setting:—
   Large Hand—*Simultaneously.*
   Small Hand—*Full many a gem of purest ray serene*
   The dark unfathomed caves of ocean bear.
2. Explain clearly deduction and induction, and point out in what lessons each might best be used.
3. Write an essay on "The Feudal System: its Advantages and Disadvantages."
4. What is comparison of adjectives? Why cannot some adjectives be compared? Give examples.
5. Write notes on the following:—
   (*a*) "Thou naughty knave."
   (*b*) "What tributaries follow him to Rome."
   (*c*) "Disrobe the images if you do find them decked with ceremonies."
   (*d*) "To stale with ordinary oaths my love to every new protester."
   (*e*) "Æneas, our great ancestor."
   (*f*) "There was a Brutus once."
   (*g*) "A son of Rome."
6. Why does Europe contain most of the great powers of the world?
7. How is the revenue in India obtained? What advantages have the people derived from British rule?
8. Say what you can of the Investiture dispute. How was it settled?
9. What do you know of the social life of the Normans?
10. How can you tell, from examination of a vulgar fraction, whether it can be expressed as a finite or recurring decimal; and if the latter, how many non-repeating and repeating figures there will be?
11. (i.) Simplify—

$$\frac{\frac{a}{b}-\frac{b}{a}}{\frac{a}{b}+\frac{b}{a}-1}-\frac{1+\frac{b}{a}+\frac{b^2}{a^2}}{\frac{a}{b}-\frac{b^2}{a^2}}.$$

Ans. $\frac{a^2(a-2b)}{(a-b)(a^2-ab+b^2)}$.

(ii.) Prove that

$$\frac{a+b}{ab}\left(\frac{1}{a}-\frac{1}{b}\right)-\frac{b+c}{bc}\left(\frac{1}{c}-\frac{1}{b}\right)$$

is the difference of two squares. Find its value when $a=1$, $c=\frac{1}{3}$.

Ans. $\frac{1}{a^2}-\frac{1}{c^2}$; 3.

(iii.) $\frac{2}{5-3x}+\frac{3x+4}{(5-3x)^2}+\frac{5x+6x^2+7}{(5-3x)^3}$.

Ans. $\frac{15x^2-52x+77}{(5-3x)^3}$.

(iv.) $\frac{a^2-bc}{(a+b)(a+c)}+\frac{b^2-ca}{(b+a)(b+c)}+\frac{c^2-ab}{(c+a)(c+b)}$.

Ans. 0.

12. What is a machine? What is "mechanical advantage"? Draw a diagram of a set of pulleys (block) with 1 lb. supporting 8.

SPRING EXAMINATION, 1902.
Twelfth Month—March.

The time remaining before the examination should be utilised in revising all subjects. The chief points have been indicated during the year, and should be looked up. A complete test examination is appended, and all students will find it beneficial to work through some such examination, with strict attention to the time allotted.

Particular attention should be given to neatness and proper arrangement, especially in mathematical papers. Answers should always be clear and to the point. Find out exactly what the question asks for, and confine your reply strictly to what is required. In geography and history especially, answers are frequently of little use because they are too vague and indefinite. As both subjects deal with facts rather than opinion, the answers can hardly be too terse and concise.

Final Test Examination.

The questions should be answered in the time allotted, and under examination conditions. The answers will, if desired, be marked and criticised if forwarded to Mr. A. T. Flux, The Bays, Belvedere, Kent, with a postal order for two shillings.

Candidates.

1. English.

(¾ hour. 80 marks. Answer three questions.)

(1.) Analyse the following, and parse words in italics:—

"*Perhaps* in this neglected spot is laid
Some heart *once* pregnant with celestial fire;
Hands that the rod of empire *might have swayed*,
Or waked to ecstasy the living lyre."

(2.) Explain the following:—*Storied urn; the rod of empire; some mute inglorious Milton; uncouth rhymes and shapeless sculpture; with dirges due; gaily-gilded trim.*

(3.) Explain the meaning and use of the suffixes in the following words:—*Browner, rushy, oaken, satchel, glimmer, drunkard, lawyer, homeward.*

(4.) Write a life of Gray, and mention his chief works.

(5.) What is meant by "comparison of adjectives"? Give examples.

2. Composition.

(½ hour. 40 marks.)

Write a short essay on Flowers *or* Pet Animals.

3. History.

(¾ hour. 80 marks. Answer three questions.)

(1.) Mention, with dates, *six* important statutes, and say what you can of any one.

(2.) Write two or three lines about each of the following:—Stephen Langton, Warwick the king-maker, Sir Walter Raleigh, Robert Clive, Florence Nightingale.

(3.) Explain briefly how the British Isles were united under one Parliament.

(4.) Say what you can of any rebellions that have taken place in England.

(5.) Give, with dates, the Stuart kings, state their relationship to one another, and write a short summary of the reign of one of them.

4. Geography.

(¾ hour. 80 marks. Answer three questions. Additional credit will be given for sketch-maps.)

(1.) Mention ten large rivers of the world. What is meant by *cascade, delta, watershed, river-basin?*

(2.) Upon what circumstances does the climate of any place depend?

(3.) Whence does the food supply of the English people come? (Tabulate.)

(4.) Mention six ports in Scotland, and say what they import and export.

(5.) Where and what are the following:—Staffa, Limerick, Giants' Causeway, Coventry, the Potteries, Mull, Trent, and the Downs?

5. Arithmetic.

(1 hour. 100 marks. Answer three questions, including the first if you can.)

(1.) (*a*) How could you *prove* that 6 sevens = 7 sixes?
   (*b*) How can you tell whether a vulgar fraction can be expressed as a finite decimal?
   (*c*) What is the value of $6+9\div3-4\times2+7\times10\div20$?
   (*d*) Find, mentally, the value of 961 articles at 2¾d. each.

(2.) Find the greatest common measure of 1035, 391, 598, by prime factors if you can.

(3.) Make out a bill for the following items:—

56 lbs. of sugar, at 7d. for 4 lbs.
22 oz. of cloves, at 1s. 6d. per lb.
2¾ lbs. of arrowroot, at 8¾d. per lb.
3 stones of flour, at 8½d. per lb.
25 pots of marmalade, at 3s. 6d. per dozen.
⅝ cwt. of soap, at 2¼d. per lb.

(4.) Find the value of ·848 of £4, 3s. 4d. + ·424 of £8, 6s. 8d.

(5.) A father leaves some land to his three sons: to the first $\frac{2}{5}$, to the second $\frac{1}{3}$; the third takes the rest, and finds that his share is worth £200 more than the share of the second. What was the value of the land?

6. Elementary Science.

(¾ hour. 100 marks. Answer three questions.)

(1.) A man can pick up a pole in the middle, but is unable to do so when catching hold of one end. Why is this?

(2.) What is meant by "indestructibility of matter"? Describe three experiments to prove it.

(3.) Is air heavier when it contains moisture or when it is quite dry? Give reasons for your answer.

(4.) A man sunk a well 40 feet deep, and erected a common pump over it, with the pipe going nearly to the bottom. Sometimes he could pump up water, and sometimes not (although there was water in the well). How do you account for this?

(5.) Draw a diagram to show why the earth moves round the sun.

7. Music.

(15 minutes. 15 marks. Answer three questions.)

(1.) Write out a table showing the mental effects of the notes of the scale. How may they be modified?

(2.) Name the following intervals:—

t_1–f, r–l, m–f, s–r^1.

(3.) Copy the following, and write over each note and rest its value in pulses or fractions of a pulse:—

| d :-.r | m.f:s | l :-. | s.: .m | d :- |

First Year.

1. English.

(¾ hour. 80 marks. Answer three questions.)

(1.) Analyse one of the following extracts, and parse the words in italics:—

(*a*)

"Well they eye
The scattered grain, and thievishly resolved
To escape the impending famine, often scared
As oft return, a pert voracious *kind*.
Clean *riddance* quickly made, one *only* care
Remains to *each*."

(*b*) "'Twas *theirs alone to dive* into the plan
That truth and mercy had revealed to man.
And while the world *beside*, that *plan* unknown,
Deified useless wood or senseless stone,
They breathed in faith their well-directed prayers."

(2.) Give the meaning of the prefixes in the following words, and the roots if you can:—

(*a*) *Ineffectual, transformed, undeviating, conscious, sustenance, preposterous.*

Or,

(*b*) *Retribution, perverted, consecrated, expanse, impatient.*

(3.) Write a short life of Cowper. Mention the chief writers who were contemporary with him, and name any of their works you can.

(4.) Explain four of the following:—*Babylon set wide her two-leaved brass; Cyrus; the Pharisee the dupe of his own art; Peruvian mines; chaos of contrarieties at war; the sturdy churl; self-buried ere they die; embossed and fretted wild; Aristæus found Cyrene; pyramids and mausolean pomp.*

(5.) Quote four lines from the poem you have studied, and scan them.

2. Composition.

(½ hour. 40 marks.)

Give in your own words Cowper's picture of a winter morning; *or*, Describe the causes which led him to write the *Expostulation*.

3. History.

(¾ hour. 80 marks. Answer three questions.)

(1.) What were the chief changes which resulted from the Norman Conquest?

(2.) Give, with dates, the statutes passed relating to the church in the period you have studied. Take any one, and show the necessity for it.

(3.) "A strong king was often followed by a weak son, or *vice versâ*." Give instance of this.

(4.) Say what you can of our relations with Burgundy or Scotland prior to 1485.

(5.) What do you know of three of the following:—Odo of Bayeux, Thomas Cranmer, John of Gaunt, Geoffrey Chaucer, Dunstan?

4. Geography.

(¾ hour. 80 marks. Answer three questions. Credit is given for sketch-maps.)

(1.) What are the principal ports of India? What are the chief imports and exports?

(2.) What are the chief industries of France? Mention the towns or districts in which they are carried on.

(3.) Describe clearly the constitution and government of Germany.

(4.) Point out the importance, political or otherwise, of Afghanistan, the Trans-Siberian Railway, Gibraltar, and Hong-Kong.

(5.) Where and what are the Pamirs, the Landes, the Steppes, the Tundras, the Sikhs, the Campagna?

5. Arithmetic.

(1 hour. 100 marks. Answer three questions, including the first if you can.)

(1.) (*a*) A number is divided by 210 in three steps, the factors being 5, 6, 7 in order; the remainders are 2, 3, 4. What would have been the remainders had the order 7, 6, 5 been taken?

(*b*) Find the missing term in each of the following, explaining the principle on which you work:—

(*a*) 80 : ( ) :: 160 : 14.
(*b*) 287 : 372 :: ( ) : 5376.
(*c*) ( ) : 342 :: 58 : 12.

(2.) Seven men agree to mow a field in five days, working eight hours a day; but at the end of three days two of the men leave their work. How many hours a day must the remainder work to complete the task in the time agreed upon?

(3.) If the manufacturer makes a profit of 20 per cent., the wholesale dealer a profit of 25 per cent., and the shopkeeper a profit of 40 per cent., what was the original cost of an article bought in a shop for 17s. 6d.?

(4.) By selling eight tons of tea at 1s. 6½d. per lb. a merchant loses 7½ per cent. At what price should he sell it in order to gain 10 per cent.?

(5.) At what rate per cent. simple interest will £4317, 10s. amount to £5019, 1s. 10½d. in four years four months?

6. Mathematics.

(1 hour. 100 marks. Answer two questions in each section.)

Section I.

(1.) Define point, circle, obtuse angle, parallel straight lines. Of what parts does every proposition consist? What is meant by *reductio ad absurdum?*

(2.) The angles which one straight line makes with another straight line on one side of it are two right angles, or are together equal to two right angles.

(3.) The base BC of a triangle ABC is bisected in D. Show that AB is greater or less than AC according as the line drawn from D at right angles to BC meets AB, or AB produced.

Section II.

(1.) Simplify the following expressions:—

(i.) $\{2x + y - (x + 2y)\} \times \{3x - 2y - (2x - 3y)\}$.

(ii.) $\left(1 - \frac{a}{b}\right)b + \left(1 - \frac{b}{c}\right)c + \left(1 - \frac{c}{a}\right)a$.

(2.) Add together $3a + 5b - c$, $2a - 4b + c$, $\frac{b}{2} - a + \frac{c}{3}$, and from the sum subtract $\frac{a}{2} - \frac{b}{2} - \frac{c}{3}$.

(3.) Multiply $3x^3 + 4x^2y - xy^2 + 4y^3$ by $x - 2y$, and prove the result by division.

7. Elementary Science.

(¾ hour. 100 marks. Answer three questions.)

(1.) One lb. of water at 0° is mixed with one lb. at 100°, and one lb. of water at 0° is mixed with one lb. of mercury at 100°. Would there be any difference in the temperature of the two mixtures? Explain clearly.

(2.) Draw a diagram to show the changes in volume when ice at – 20° C. is warmed till it passes off as steam.

(3.) A person looks vertically downwards into water at a pebble. Draw a diagram to illustrate the different positions assumed by the pebble as the person walks away. When does it disappear?

(4.) Account for the colours in the rainbow.

(5.) Why does the moon appear to be larger when just above the horizon than it appears when high up in the heavens?

8. Music.

(15 minutes. 15 marks. Answer three questions.)

(1.) Rewrite the following in the first sharp key:—

r m fe s d' t r' s m' r' m d s.

(2.) Name the intervals made by each of the following notes with the others:— **d fe s l.**

(3.) Write the following in two-pulse measure, primary form:—

1 ♩ ♩ ♩ 𝅗𝅥 ♩ ♩ 𝅗𝅥 𝅗𝅥 𝅝

d m f s d' t l s m r d.

Second Year.

1. English.

(¾ hour. 80 marks.)

(1.) Analyse the following passage, and parse the words in italics:—

"For sight no obstacle found here, nor shade,
But all sunshine, *as* when his beams at noon
Culminate from the equator, *as* they now
Shot upward *still direct, whence* no *way round*
Shadow from body opaque *can fall.*"

(2.) Write explanatory notes on the following:—*My umpire Conscience; immortal amarant; Empedocles; Hesperian gardens; volatile Hermes.*

(3.) What was the Arian heresy? Give evidence from the poem to show that Milton held this belief.

(4.) Give the etymology of the following words:—*Blaspheme, preamble, mansion, admiration, fruition, umpire.*

(5.) Point out the chief sources from which the English language is derived.

2. Composition.

(½ hour. 40 marks.)

Write a short essay upon "*Paradise Lost,*" or "The Use of Colonies to the Mother Country."

3. History.

(¾ hour. 80 marks. Answer three questions.)

(1.) What were the chief points of dispute between the Stuarts and their Parliaments? How were they finally settled?

(2.) What were the Addled Parliament, Pacification of Berwick, Pride's Purge, Self-denying Ordinance?

(3.) Point out the chief results of the following battles:—Blenheim, Plassey, the Nile, Navarino, Quebec.

(4.) Under what circumstances was Ireland united with Great Britain in one Parliament?

(5.) With what important events were the following connected:—Wilberforce, Hastings, Titus Oates, Prince Rupert, Robert Blake?

4. Geography.

(¾ hour. 80 marks. Answer three questions. Credit is given for sketch-maps.)

(1.) Give, by means of a map, the chief rivers and mountains of Africa, and point out briefly any peculiarities of the rivers.

(2.) Say what you can of the government of the United States.

(3.) Mention any points of contrast between Canada and Australia.

(4.) Write about fifteen lines on one of the following:—Newfoundland, Ceylon, North Island (New Zealand), Natal.

(5.) Where and what are the following:—Mackenzie, Tchad, Clutha, Kandy, Halifax, Port Elizabeth, Spanish Town?

5. Arithmetic.

(1 hour. 100 marks. Answer three questions, including the first if you can.)

(1.) (*a*) How often can you take $\frac{5}{11}$ from $13\frac{1}{2}$? What will be left?

(*b*) Find the sum of all the numbers between 300 and 500 which are divisible by 23.

(*c*) Find the least number by which 4851 must be multiplied that the product may be a perfect square.

(2.) The average age of a committee of seven trustees is the same as it was five years ago, a younger man having been substituted for one of them. How much younger was he than the man whose place he took?

(3.) A has £17,500 in 3 per cent. stock. He sells out at $96\frac{1}{4}$ and reinvests in $4\frac{1}{2}$ per cent. stock at $134\frac{3}{4}$. How much is his income increased? (Neglect brokerage.)

(4.) A man is seventy-two years old, and his wife sixty-three. When they were married he was half as old again as his wife. How long have they been married?

(5.) A cube contains 50·653 cubic yards. Find the length of an edge, and the total area of all its faces.

6. Mathematics.

(1 hour. 100 marks. Answer two questions in each section.)

Section I.

(1.) Prove the corollaries to I. 32.

(2.) The opposite sides and angles of a parallelogram are equal to one another, and the diagonal bisects it. The diagonals of a parallelogram are equal. Find its angles.

(3.) The complements of the parallelograms which are about the diagonal of any parallelogram are equal to one another. If the parallelogram be a square, prove that the parallelograms about the diagonal are also squares.

Section II.

(1.) How do you prove that $\frac{a}{b} \div c = \frac{a}{bc}$, where a, b, c represent *any* numbers?

Simplify—

(*a*) $\dfrac{3x^2 - 8x + 5}{x^3 - 4x^2 + 5x - 2}$.

(*b*) $\left(y - \dfrac{a^2 - yx}{y - x}\right)\left(x + \dfrac{a^2 - xy}{y - x}\right) + \left(\dfrac{a^2 - xy}{y - x}\right)^2$.

(2.) Solve—

(*a*) $\dfrac{249 - 9x}{14} - \dfrac{9x - 13}{4} = \dfrac{3x + 1}{7} - \dfrac{7x + 9}{8}$.

(*b*) $\begin{cases} x + \dfrac{1}{y} = 1. \\ y + \dfrac{1}{x} = 4. \end{cases}$

(3.) Show that the sum of the squares of any three consecutive odd numbers, increased by one, is always divisible by 12.

7. Elementary Science.

(1 hour. 100 marks. Answer three questions.)

(1.) How would you show the composition of water by analysis and synthesis?

(2.) Describe exactly what you *see* when—

(*a*) A piece of phosphorus is put into a bell-jar containing air over water;

(*b*) Mercuric oxide is strongly heated in one end of a long glass tube;

(*c*) Carbon dioxide is passed through lime-water.

(3.) What is the "fur" on the inside of a kettle, and how is it formed?

(4.) What is meant by a saturated solution? What happens when a hot saturated solution of alum is allowed to cool slowly?

(5.) A strong bar magnet is laid on a table, and a small pivoted magnetic needle is moved round it in a circle. Draw a diagram illustrating the various positions assumed by the latter.

8. Music.

(15 minutes. 15 marks. Answer three questions.)

(1.) Construct a scale, and put in all the chromatic notes. Upon what principle are they named?

(2.) Which of the following notes is highest and which lowest:—**Lah** in key B flat, **ray'** in key G, **s,** in key A, **t** in key C?

(3.) Explain the following terms:—*Adagio, staccato, mf, D.S., ad lib.*

CORRESPONDENCE: RULES (as usual).

Answers to Correspondents.

W.S.—There is no official publication of the kind. A. Cann, Esq., B.A., P.T. Centre, Bolton, might tell you what you want.

Nauplia.—Your drawing would probably get 75 per cent. of marks. Great care is needed in the lining-in.

(*Other correspondents answered by post.*)

GENERAL INFORMATION FOR SCHOLARSHIP.

LAST month we advised our readers to study one of the little school books on the *Life and Duties of a Citizen*. This month we would recommend the careful perusal of the *Primer of Greek and Roman Mythology* (Dent and Co.), or the *Primer of Greek Antiquities* and the *Primer of Roman Antiquities* (Macmillan and Co.). The subject-matter of these little books should be known by every teacher, owing to the numerous references to Greek and Roman mythology and antiquities which are met with in our own literature.

The scientific study of living objects is known as biology, and it embraces botany, or the study of plants, and zoology, or the study of animals; and although such special knowledge does not come under the head of "General Information," yet every intelligent person is supposed to know the more common facts about animals and plants—that is to say, he is supposed to know the more important parts of natural history. We propose to indicate some of these in this present paper. The student should understand the broad features of the classification of plants and animals, particularly of the latter. This will enable him to avoid the mistake, so often made, of calling the whale a fish because it lives in the sea, or of calling lobsters and oysters fish because they may be purchased at the fishmonger's. He should also be ready with illustrations of that wonderfully fascinating subject the adaptation of structure and of habits to environment.

The whole animal kingdom includes eight sub-kingdoms; and although, generally speaking, the sub-kingdoms in the order here given increase in complexity, yet the lowest member of one group may be much simpler than the highest of the sub-kingdom preceding it.

Sub-kingdom 1, *Protozoa*—the simplest of all animals, having neither body-cavity nor nervous system.

Sub-kingdom 2, *Polystomata*—sponges, which have an internal cavity with one outlet and many inlets. Some naturalists regard sponges as colonies of protozoa, and thu make one sub-kingdom less.

Sub-kingdom 3, *Cœlenterata*—jellyfishes and sea-anemones. Their bodies radiate from a centre; they either have no stomach at all, or one which opens into the body-cavity. The food is taken into the body, and the residue ejected by the same opening.

Sub-kingdom 4, *Echinodermata*—the sea-urchins and starfish. Their bodies also radiate from a centre, and are composed, as a rule, of five segments, but sometimes of a multiple of five. Their stomach is separate from the body-cavity, and they are provided with a system of water-vessels; and on the under side of the body they have a number of hollow feelers or limbs, which can be extended by having water forced into them, and thus the animal is able to move about.

Sub-kingdom 5, *Vermes*—worms. Their bodies consist of a succession of similar segments; they have *no jointed limbs;* and though they often have vessels containing a red fluid, the colour of this fluid is not due to red blood corpuscles. The earthworm has no eyes, but apparently can distinguish light from darkness by the general surface of the body. Beware of such statements as that "if a worm is cut in two, the pieces join together again," or that each part grows into a complete worm. The vital organs of the earthworm are found in the tenth to the fifteenth segment; and although a worm may survive the loss of some of the hinder segments, yet those segments could never develop into a complete worm.

Sub-kingdom 6, *Arthropoda*—segmented animals with *jointed limbs*, including insects, spiders, scorpions, shrimps, lobsters, centipedes, and mites. These have a much greater difference in the development of the different segments than is found in the worms, but some naturalists describe these as two divisions of one sub-kingdom.

Sub-kingdom 7, *Mollusca*—cockles, oysters, cuttlefish, nautilus, and snails. These are soft-bodied animals, commonly provided with a shell.

Sub-kingdom 8, *Vertebrata*—animals with a backbone, including fishes, frogs, snakes, birds, and mammals.

We cannot go into the subdivisions of these sub-kingdoms, but will say a few words about some of the more important classes.

Insects belong to sub-kingdom 6. Their body consists of *three* distinct parts—head, thorax, and abdomen; hence spiders are not insects, as the head and thorax are not separated. The head bears a pair of compound eyes, consisting in the case of the house-fly of two thousand, and in the case of the dragon-fly of twenty-eight thousand parts each. The feelers are not only organs of touch, but also of hearing, and possibly of smell. The thorax consists of three rings more or less completely joined together. These are the only parts that bear legs; hence *an insect has only six legs*. The third (and frequently also the second) segments of the thorax may be provided with wings. Some insects (*Aptera*) have no wings, some have two, and others have four. The abdomen is traversed by a network of tubes, through which the animal breathes. These tubes open on the side of the abdomen, and are not connected with the mouth; hence if a fly is watched after he has escaped from a milk-jug, he will be seen to wipe his sides, and not his mouth, in order to recover his breath. One very remarkable feature in the life of an insect is the great difference between its condition at one period and that at another. Most insects emerge from the egg in the form of grubs or caterpillars. They commonly have six pointed feet, which represent the six legs of the adult, and several pad-like feet behind these, which vary in number in different species: "loopers," such as the caterpillar of the magpie-moth, have only four, and move about by arching the body into a loop, holding by the hind feet, and then straightening the body out. Hence the question, "How many legs has a caterpillar?" should be answered by saying that there are six pointed legs and a varying number of pad-like feet, or else it is indefinite altogether. The next stage is the chrysalis, in which the creature is covered by its hardened skin or by a network of silken threads. At last the perfect insect emerges in a full-grown state.

The body of a centipede has at least twenty segments provided with legs; hence, although its name implies that it has a hundred legs, it may have but forty.

In dealing with the second topic we have suggested, we might consider the most important objects in the life of an animal are to escape from its enemies and to obtain its food. Among the means of escape we find:—(*a*) Hard defensive covering, as in the case of the tortoise, oyster, lobster, and crab. One sort of crab, the hermit crab, has such a soft covering for the abdomen that it is obliged to hide in an empty winkle or whelk shell. Another, the maja, has a thin shell; but the shell is furnished with a vast number of little hooks, to which the animal attaches pieces of seaweed, and thus escapes the observation of his enemies. (*b*) Injurious defensive coats, as in the case of the hedgehog, porcupine, stickleback, and perch. (*c*) Defensive coloration. The animal assumes the colour of its surroundings, and sometimes also the form: thus the rabbit living on the sandy heath is tawny; the arctic animals assume the colour of the snow; parrots, which are not generally birds of strong flight, assume the green colour of the trees in which they live. So ptarmigan and Norwegian hares are brown in summer, but white in the snowy winter. The same is true of the stoat, which in its white winter dress is called the ermine. Some insects escape from birds that would prey upon them because of the resemblance they bear to sticks or leaves. Flat fish, such as soles and plaice, have the upper surface of the same colour as the sand on which they rest. Brightly-coloured fish generally have an objectionable taste; otherwise, being so easily seen, they would soon succumb to the attacks of others that would prey upon them. (*d*) Habits of concealment. Rabbits seek safety in holes, and many other animals have regular hiding-places. (*e*) Good means of locomotion. Many animals seek safety in flight; but this is really the least satisfactory means of escape, as their enemies are commonly swift also.

The many special arrangements by which animals procure their food afford material for very interesting study. So important is the manner of procuring food, that the organs employed are among the special features used in classifying animals. Thus the teeth and claws of mammals, the feet and beaks of birds, are very important organs, and serve to mark the difference between one class and another.

Animals that chew the cud are said to have several stomachs; but if by "stomach" we mean a place where digestive processes go on, the statement requires a little qualification. The *rumen*, or so-called first stomach, is only a receptacle for the hastily-swallowed food. And now we see why the ruminants are all grass-eating animals. Such animals must seek their food in the open plains, and those that are able to gather a large quantity quickly and then retire to a spot safe from beasts of prey, in order to masticate and digest their meal, have an immense advantage over others. The manner of seizing food varies extremely. The cow gathers the grass into a bunch with her tongue before biting it; the horse collects it with his lips. The frog's tongue is fixed in front and free behind, so that he can thrust it out a very long way; several lizards also catch insects on the sticky extremity of the tongue. The tongue of the woodpecker is so long and so sharp that the grubs are speared and drawn out by it from the innermost recesses in the trees.

NOTES ON "QUENTIN DURWARD."

(*Continued.*)

(*N.B.—The pages refer to the New Century edition of the novel published by Messrs. T. Nelson and Sons, 35 Paternoster Row, London, E.C. 2s.*)

CHAPTER X.

Page 143. ***Cajolement.*** Coaxing, wheedling, persuading.

144. ***Flemish dray-horse.*** Flemish horses were stout and strong animals, and such indeed were needed to carry a knight clad in complete armour.

146. ***Popinjay.*** Parrot. Loosely used for any bird with bright plumage.

147. ***Splendid sunrise*—that is, the Renaissance, when both literature and art increased enormously all over Europe.**

148. ***Orlando,*** or Roland. The nephew of Charlemagne, and one of the most famous of the paladins. He possessed a famous horn of ivory, mentioned in *Marmion,* Canto VI.:—

> "Oh for a blast of that dread horn,
> On Fontarabian echoes borne,
> That to King Charles did come,
> When Roland brave, and Olivier,
> And every paladin and peer,
> On Roncesvalles died!"

149. ***Arras.*** Tapestry covering the walls; so named from Arras in Artois, famed for its manufacture.
Murder of King Duffus. King Duffus of Scotland was murdered by the governor of Forres Castle in 961.

150. ***Architraves.*** The ornamented stonework resting on the top of the columns of a building.

151. ***Cabaretier.*** Innkeeper.

152. ***Beaufet.*** Modern, *buffet,* a sideboard. Lat. *bufetum* = a cupboard.

153. ***Quis custodiat ipsos custodes?*** A well-known Latin quotation. "What shall guard the guardians themselves?"
Murder of Douglas. James, Earl of Douglas, after several acts of rebellion, visited James the Second in the castle of Stirling, upon a promise of safe conduct. The king, irritated by some personal affront, drew his dagger and stabbed him.

157. ***Badauds.*** Gossips; boon companions.
Mieux vault bon repas que bel habit. "Better a good meal than a fine coat."
Auxerre est le boisson des Rois. Auxerre is the drink of kings.

CHAPTER XI.

161. ***Benedicite.*** Blessing; grace after meat.

164. ***Cymar.*** A light covering or scarf.

170. ***Bacchus.*** The god of wine and revelry.

172. ***Large mirror,*** etc. Venice enjoyed for many years a monopoly in the manufacture of glass, for which indeed it is still famous.

CHAPTER XII.

174. ***Par amours.*** By love; generally, by secret intrigues.

175. ***Bailley.*** The court of a castle, between the outer wall and the central keep.

176. ***Ice-heaps.*** Avalanches.

177. ***Chaldeans,*** or Chaldees. Inhabitants of Babylonia—a race of people supposed to be able to foretell the future. The belief possibly arose from the visit of the wise men to Bethlehem.

178. ***Occult science.*** Knowledge of hidden things; the mysteries of life.

179. ***Asylum.*** Shelter.

181. ***Gauntois and Liegeois.*** The townsmen of Ghent and Liège.
Ban of the Empire. Outlawed by proclamation of the Empire. The German-speaking peoples were united in a loose confederation, representatives of the various states forming the Imperial Chamber mentioned below.

183. ***Plebeian.*** Lat. *plebs* = the common people, as opposed to the nobles.

185. ***Innuendo.*** Suggestion; insinuation.

186. ***Sancte Juliane,*** etc. O holy Julian, help our prayers; pray for us.
Horoscope, etc. His future foretold by means of the position of the planets at his birth. There was a general belief that the stars exercised an influence upon a man, traces of which superstition remain in such phrases as—"His star is rising;" "my stars!" "his guiding star."

CHAPTER XIII.

191. ***Maitre d'Hotel.*** Steward; chief servant.
Sage Eastern Monarchs. Melchior, Gaspar, and Balthazar, the three kings who followed the star and brought presents to the infant Christ. Tradition says they died in Cologne; and their shrine and skulls are exhibited in the cathedral.
Astral intelligences. Knowledge obtained by consulting the stars.
Galeotti. *Vide* Scott's note on page 558.

192. ***Panegyrics.*** Praises, often extravagant.
Matthias Corvinus. King of Hungary (1458-90); maintained the throne against the Emperor and the Turks.
Ascetic. Hard-living; self-denying.
Janus Pannonius. A Hungarian poet.

193. ***Astrolabe.*** An astronomer's instrument for observing and calculating the exact position of a star.
Jacob's staff. A rod with cross pieces used by surveyors, and formerly (but not now) by astronomers. The name was originally given to the staff used by pilgrims who visited the shrine of St. James (Jacobus) of Compostella.
Mail and ***plate.*** Mail armour was made of interwoven steel rings; "plate," as the name implies, of plates of metal.
Toledo. Toledo, in Spain, was famous for its sword-blades, so exquisitely tempered that they could be coiled round like a watch-spring.
Broadsword. A heavy sword with two cutting edges. ***Scymitar,*** a curved sword of the shape usually adopted in Eastern countries.
Penates. The household gods of the Romans.
Hermetical Philosophy. Hermes Trismegistus, a Chaldean philosopher ("the Thrice Great"), was the supposed inventor of chemistry. The "philosophy" mentioned was that there were only three principles—salt, sulphur, and mercury—from which everything was derived.

Page 193. ***Hieroglyphics.*** Writings by signs and shapes, and not letters.
Art of printing. First practised at Mayence, on the Rhine. The first book from the Frankfort Press was issued in 1507.

194. ***Santon.*** An Eastern sage, a kind of dervish, regarded as a prophet.
Frogs. Lace round a buttonhole, or a loop to fasten a button. Derived from Lat. *floccus* = a piece of wool. Port. *froco.*
Zodiac. The twelve constellations through which the sun appears to pass during the year.

195. ***Palmistry or chiromancy.*** The pretended art of foretelling the future from the lines on the hand.

196. ***Linea vitæ.*** Line of life, encircling the base of the thumb.

197. ***Sancti quotquot,*** etc. Whatever saints are present, pray for me a sinner.
Ephemerides. An astronomical almanac.

198. ***Combust.*** Situated so near the sun as to be hidden by its rays. Applied to the moon and planets when they are within 8½° of the sun.
Nostradamus. Michael, an astrologer who published an ancient almanac something of the character of the modern "Old Moore's." As he lived 1503-66, he could not have been known to Louis.

200. ***Post tot promissa.*** After so many promises.
Cham. The sovereign prince of Tartary. Now written Khan.

CHAPTER XIV.

202. ***Sumpter mules.*** Mules for carrying baggage, the roads of this period being too bad to permit the use of wheeled vehicles.

204. ***Valentinian I.*** Emperor of Rome (321-75); carried on wars against the Gauls.

206. ***Wenceslaus IV.*** (1361-1419), King of Bohemia and Emperor of Germany; abdicated in 1400. He was not, therefore, emperor at the time referred to.
Dais of three degrees. A platform approached by three steps.

207. ***Rhinegrave.*** The feudal lord of the valley of the Rhine in its lower middle course.

208. ***Rheinwein.*** Rhine wine.

210. ***The Grève.*** Criminals were executed in the Place de Grève in Paris; hence the "Lady of the Grève" was an appropriate patroness of a hangman.
Patibularius. Lat. *patibulum,* a gibbet.

211. ***Jerry-come-tumbles.*** Tumblers; performers on a rope.

212. ***Devoir.*** Duty.
Cap de dieu. By the head of God.

213. ***Take ground for your career.*** Choose a distance which will enable you to charge with lance in rest.

214. ***Ventre Saint Gris.*** A somewhat meaningless oath; the favourite expletive of Henry of Navarre.

CHAPTER XV.

216. ***Callant.*** Scotch for *lad;* derived from the French *galant.*

217. ***Canaille.*** Men of low birth; dogs. (From Lat. *canis* = a dog.)
Planet-struck. The heavenly bodies were created with the power of strongly influencing human beings. (Compare *moonstruck, lunatic.*)

219. ***Broke on the wheel.*** A barbarous punishment of the Middle Ages. The victim was tied across the spokes of a large wheel, and the longer bones broken with a heavy bar.
Loom. A.S. *geloma* = an instrument. Properly, any tool or instrument; here, the helmet.

220. ***Echevin.*** A city magistrate or high official.

221. ***Loches.*** About twenty-five miles from Tours, on the Indre; a famous state prison. One of the methods of getting rid of prisoners was to confine them in dungeons below the level of the river, the water of which could be admitted by opening a sluice, thus drowning the occupants.

223. ***Leech-craft.*** Surgery.

225. ***Tying the napkin around his arm.*** Wearing a lady's colours was the usual sign in those times of confessing an attachment to her. This act of Quentin's led to difficulties later on.
Blazoned. Described in proper heraldic language. (See *Ivanhoe,* chap. xxix., where Rebecca describes the Black Knight as having on his shield "something resembling a bar of iron and padlock painted blue." Ivanhoe "blazons" it as "a fetterlock and shacklebolt azure.")

CHAPTER XVI.

229. ***Mahoun.*** Mahomet. (See note on page 558, "Religion of the Bohemians.")

233. ***Shambles.*** Slaughter-house.

234. ***Ubiquity.*** Being everywhere.
Naïveté. Simplicity.

235. ***Marechaussée.*** Mounted police.
Cautery. The act of burning with a hot iron. "Steel and cautery" = "fire and sword."

236. ***Major-domo.*** Steward; ***maitre d'hotel.*** (*Vide* p. 191.)

237. ***Jeshurun.*** Deut. xxxii. 15.

238. ***Etiam in cubiculo.*** Even in the bedroom.
Votaresses. Those who have taken a vow.

239. ***Lapis offensionis et petra scandali.*** A stone of offence and stumbling-block.
Ne molaris, etc. Do no harm against your friend who lives in peace with you.

240. ***Si non payatis,*** etc. If you do not pay, I will burn your monastery. This sentence is called "jargon," because it is a mixture of French and Latin.
Pereat, etc. May the wicked man perish—Amen, let him be cursed!

241. ***Sacristan.*** An officer of the church who has charge of the sacristy and its contents.

CHAPTER XVII.

244. ***Rendezvous.*** A meeting-place agreed upon by any persons.
Stalk them. Creep up close to them, as a hunter does to a stag.

245. ***Silvan habits.*** Habits acquired from hunting the woods.
Bastinading. Flogging. The term is now generally restricted to the flogging on the soles of the feet, as administered in China and the Turkish dominions.

Page 246. *Tiffany.* A kind of thin silk gauze. Probably derived from Old Fr. *tifer*, to deck.
Donner and blitz. Thunder and lightning (German).
Meinherr. Mister, monsieur.
247. *Was henker.* What the deuce!
Hagel and sturmwetter. Hail and stormy weather.
Poz tausend. The deuce!
Das ist. That is.
Der Bischof. The Bishop.
Hauptman. Captain.
Teufel. Devil.
Hertzogs. Dukes.
Snab at the wein-kellar. Snap at the wine-cellar.
Garces. Girls; young women.
248. *Mein Gat.* My God.
Donner and hagel. Thunder and hail.[1]
Aldeboran. A particularly bright star; one of the constellation Taurus.
Du bist ein comische man. You are a funny fellow.
249. *Fahnlein.* A troop; company.
Gross sternen-deuter. Great star-gazers.
Geister-seers. Ghost or spirit seers.
Termagund. A Persian deity. The Crusaders applied to their opponents terms which were often incorrect—for example, they called them all Saracens. They also confused the Persian Termagaunt with Mahomet; hence the frequent connection of "Mahound and Termagaunt."
252. *Seneschal.* An officer, in the residences of princes and lords, who superintended the whole household.
255. *The object of his devotion was misplaced.* Scott says this because it was addressed to the three kings instead of directly to God.

OUR CERTIFICATE COURSE FOR 1902.

BY GEORGE COLLAR, B.A., B.SC.,
Head-Master of the Stockwell Pupil Teachers' School.

TEST QUESTIONS ON LAST MONTH'S WORK.

THEORY OF TEACHING.

1. How may history be used to train and discipline the imagination?

2. In what ways should geography and history be brought into connection in teaching?

3. Does drawing form part of an "elementary" education? If so, how much art teaching can be considered "elementary education"? What reasons does Locke give for teaching drawing?

ARITHMETIC.

1. A man deposited £1000 in a bank on 21st Sept., and added £400 on 11th Oct., and withdrew £240 on 3rd Dec. How much interest was due to him on 31st Dec., the rate being 2½ per cent. per annum?

2. If the discount on a bill for £850, due in a certain time, is £40, what is the discount on a bill for £325, due in half the time, the rate being the same in both cases?

ENGLISH LITERATURE.

Describe the character of Lady Macbeth, illustrating your answer by quotations.

GEOMETRY.

1. Show that the straight line joining the middle points of two parallel chords passes through the centre of the circle.

2. Show that if the distance between the centres of two circles be equal to the difference, or the sum, of their radii, they will touch one another.

3. Draw two tangents to a given circle such that the angle between them will be equal to a given angle.

FRENCH.

1. Give, and illustrate, the two principal rules for French pronunciation.

2. How does the rule for the tonic accent affect the formation of the feminine of nouns and adjectives?

3. Translate into French:—

Feudal society rested upon certain rights and upon certain customs which we must study. The fundamental ceremony of feudalism, that by which the vassal pledged his faith to his suzerain and became his *man*, was called homage; it gave some rights to the suzerain, and also imposed upon him some duties towards his vassal.

4. Translate into English:—

Le génie littéraire de la France au XVII^e^ siècle s'est formé sous deux influences: la religion et la monarchie absolue. Les lettres françaises se renferment alors presque exclusivement dans la région de l'art. L'histoire politique peut exercer sur elles une certaine influence: elles n'en exercent elles-mêmes aucune pour ainsi dire sur cette histoire.

POLITICAL ECONOMY.

1. Discuss the right of workmen to combine in order to obtain higher wages.

2. In what ways are trades-unions said to be exercising a prejudicial effect on the industries of this country?

NOTES AND SYLLABUS FOR MARCH.

ENGLISH COMPOSITION.

Revise rules for the structure of the sentence and paragraph, and for punctuation.

Write essays on the following subjects:—

1. Home Lessons.
2. Punctuality.
3. Some Winter Amusements.

THEORY OF TEACHING.

(*a*) Study the chapter on the teaching of geography (Collar and Crook, chap. xi.). The importance of this subject in the elementary school is becoming more and more recognised, and the objects to be aimed at and the methods to be employed are no longer what they used to be. The recitation of strings of names of capes or of counties and county towns no longer passes as evidence of good teaching in geography. Geography should aim at training the *imagination*. By the help of pictures, models, plans, and maps, as well as by the clearness of the teacher's descriptions, the children must be led to imagine the appearance, etc., of mountains, seas, rivers, towns, and countries which they have never seen, and probably never will see. Then it should aim at training the *memory*—not the mechanical memory of mere names, but the intelligent power of recalling facts, not isolated, but related to one another; and although the mere learning of names is to be condemned, the teacher must be careful to avoid the mistake of trying to do without names altogether. Lastly, geography affords splendid opportunities for training the reasoning powers; and although, in general, these powers are the latest to mature, yet the connection between cause and effect in geography is often so simple that even children can be taught to discover it. Thus, in the lessons on rivers, children should be asked to account for the direction of rivers, or for the fact of longer rivers being found on one side of a country or continent than on the other. The essential characters of good maps should be noted, both of those for class teaching and those for individual work.

(*b*) Study Dexter and Garlick, chap. xxi. This important chapter deals with the will; and as the consideration of the working of the will is the foundation of the study of ethics, it is necessary to study this chapter very thoroughly. The responsibility for any act depends upon the extent to which it was performed *voluntarily*. The first essential for any voluntary act is that there shall be in the mind an idea of the movement that may be performed. The very presence of this idea is often stimulus enough to cause the act to be performed, although generally other causes may prevent the performance either wholly or partially. The *tendency* of the presence of the idea to produce the act is made use of by thought-readers. Thus, a person thinks of a particular article among several, and consequently has present in his mind the idea of pointing it out to other people; this very idea tends so strongly to make him indicate the article he is thinking of, that, in spite of himself, he gives an indication when the thought-reader passes his hand in the neighbourhood of the article. The power of thought-reading depends upon the recognition of this commotion, and is known to be possessed by the more intelligent animals. One of our great astronomers had a dog which would never fail to indicate the number which was the answer to a calculation, no matter how complicated, when his master passed a pointer along a series of cards with the numbers on them.

But in *willing* there is generally a brief period of indecision during which we deliberate, and then the motor impulse is liberated, the particular impulse liberated depending upon a decision due to the prominence of some idea either from within or without. The great thing is to acquire such a stock of right ideas that the proper decision may be made without effort; and the most important part of volition is the act of fixing the attention on the right idea. The question of the absolute freedom of the will is so tremendous that it had better be left alone. The chapter under consideration shows how the wills of children are best trained by being subjected to such conditions that the right idea may be present in the mind when it is required.

(c) Prepare Locke's *Thoughts on Education*, Sections 162–170. His remarks on the teaching of French and Latin should be carefully compared with the ninth chapter of the *School Management*. Although there are certain difficulties in the way of his method of teaching Latin, yet it would have been an infinitely better plan to teach Latin as though it were a living language than to teach it by methods which fail to recognise the essential qualities of a language, and which have been largely responsible for the teaching of modern languages as though they were dead.

English Literature.

Prepare *Paradise Lost*, Book I., lines 1–330,—

> "Of man's first disobedience.....
> Awake! arise! or be for ever fallen!"

The student should read through the whole of the twelve books, as a duty he owes to the literature of his country, if for no other reason; and in all probability, long before reaching the end, he will be glad he has undertaken the task. After he has got so far acquainted with the work for himself, he should read other people's criticisms on Milton's work; under these circumstances, they will help him to appreciate the beauties of the work. The best books to read on the subject are Addison's papers published in *The Spectator* (these have been collected and published in a little volume by Chambers), and Dr. Johnson's Life of Milton in his *Lives of the Poets*, which deals with Milton's works in a very learned manner, but some of his criticisms are rather captious; it should, however, be carefully read, as should also Macaulay's *Essay on Milton*. The chapter on *Paradise Lost* in Coleridge's *Literary Remains* is also well worth reading; and if any of our readers have access to Hallam's *History of European Literature*, they should read the part that treats of Milton's works.

The introduction to the Globe Edition of *Milton's Works*, by Professor Masson, contains an account of Milton and his poems which it will be difficult to surpass.

Paradise Lost belongs to that class of poems known as epic poems, which includes in Greek the *Iliad* and *Odyssey* of Homer, in Latin the *Æneid* of Virgil, and in Italian *Jerusalem Delivered* of Tasso and Dante's *Divina Commedia*, consisting of the *Inferno*, *Purgatorio*, and *Paradiso*. These may be regarded as the great epic poems of the world, and Milton's *Paradise Lost* does not suffer by being compared with any of them.

The characteristics of epic poetry are admirably summed up by Arnold as follows:—"The subject of the epic poem must be some one, great, complex action. The principal personages must belong to the high places in society, and must be grand and elevated in their ideas. The measure must be of a sonorous dignity befitting the subject. The action is developed by a mixture of dialogue, soliloquy, and narrative."

As our space is limited, we must leave our readers to trust to the notes in their text-books, and invite them to ask for help on any points not sufficiently explained.

Arithmetic.

Study the chapters on stocks, and monetary systems and exchange.

History.

Those of our readers who are taking the history course will derive great benefit from the summary of the history of the period just published by Mr. Rydo, 79 Gresham Street, E.C. The facts which cover such a wide area are here brought together and tabulated in a way that is very useful, especially for examination purposes.

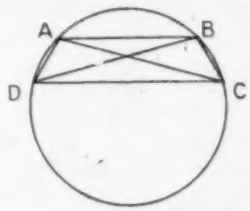
Geometry.

Women.—Prepare to the end of Book III.

It will be remembered that in the first book Euclid defines first "a plane angle" and then a "plane *rectilineal* angle," thus implying that there are some plane angles which are not rectilineal. The eighth definition of the third book states that the angle *of* a segment is the angle contained by the chord and the arc it cuts off. This is the only reference in Euclid to curvilineal angles; but it is worth while noticing how such angles are measured, for the inclination of one curved line to another, or to a straight line, varies at different points in the line. Hence it is agreed that the inclination of curves is the same as that of their tangents at the point of contact. If the student refers to Prop. 32 of the third book, he will see that the angle *of* a segment is equal to the angle *in* the alternate segment; and this would have been the best way of enunciating the proposition if the definition of the "angle of a segment" had been made more precise.

Solution of last month's deductions:—

1. The angles DAC and DBC are equal, because they are in the same segment DABC (III. 21).

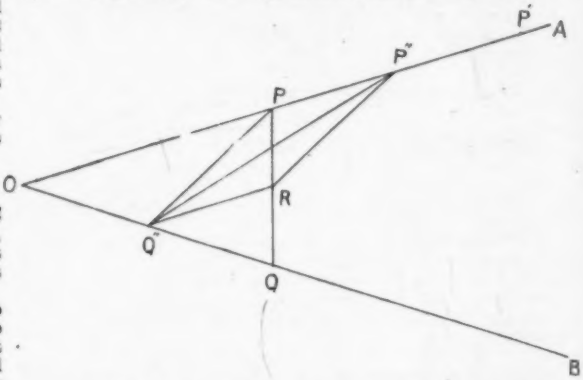


For the same reason the angles ACD and ABD are equal, and ABD = BDC (I. 29). ∴ ACD = BDC.

Then the two triangles ADC and BDC have two angles of the one equal to two angles of the other, each to each, and the side DC is common. Therefore they are equal in all respects (I. 26).

2. First take the case in which OP = OQ; then the middle point of PQ is the middle of the base of the isosceles triangle OPQ.

Next suppose OQ equal to nought; then OP′ = 2OP is the sum of OQ and OP′, and P is the point required. Similarly, if OP is equal to nought, Q is the point required. Thus, in these three particular cases the middle point of PQ lies on the line PQ.



We shall now show that this is true for all other values of OP and OQ. For if P″ and Q″ be any other positions of P and Q, then since OP″ + OQ″ = OP + OQ (hyp.), therefore PP″ = OQ″.

Draw Q″R parallel to OP″ (I. 31), and join PQ″, P″Q″, and P″R. Then Q″RQ = OPQ (I. 29) = Q″QR (I. 5).

Therefore Q″R = Q″Q (I. 5) = PP″. Therefore PP″RQ″ is a parallelogram (I. 33), and the diagonal PR bisects the diagonal Q″P″ by a well-known deduction. Hence in every case the middle point of PQ lies on the line joining the positions taken up when OP = OQ.

In the second case it can easily be shown that if lines are drawn through P parallel to OB, and through Q parallel to OA, a series of parallelograms will be formed with the diagonal through O common to them all. This will in every case bisect the other diagonal, which is the line joining P and Q. Hence this is the locus of the middle points of the lines joining P and Q. We must exclude the cases in which OP or OQ = nought.

3. Through A and C draw lines parallel to ED or BF, and through B, E, F, and D draw lines parallel to AC. Then prove by I. 33, 34, and 41.

Trigonometry.

Study the chapter on solution of triangles. The remarks made last month on the determination of heights and distances will be found to apply to the solution of right-angled triangles. The other triangles form themselves into the following classes:—

1. *With three sides given.*

If only one angle is required, use the formula—

$$\sin\frac{A}{2}=\sqrt{\frac{(s-b)(s-c)}{bc}},\text{ or }\cos\frac{A}{2}=\sqrt{\frac{s(s-a)}{bc}}.$$

But if all the angles are required, the most suitable formula is—

$$\tan\frac{A}{2}=\sqrt{\frac{(s-b)(s-c)}{s(s-a)}},$$

because in this case it is necessary to look out four logarithms only—namely, those of s, $s-a$, $s-b$, and $s-c$.

2. *With two sides and the included angle.*
The best formula, although long, is—

$$\tan \frac{1}{2}(B - C) = \frac{b - c}{b + c} \cot \frac{A}{2}.$$

This determines $\frac{1}{2}(B - C)$; and since $(B + C) = 180 - A$, B and C can be found at once.

3. *With two sides and the angle opposite to one of them.*
Here we use the formula—

$$\frac{\sin A}{\sin B} = \frac{a}{b};$$

and this is the ambiguous case, as two angles less than 180° may have the same sign.

4. *With two angles and one side given.*
It is not necessary to make two cases of this, as in Euclid I. 26; for the relation $A + B + C = 180°$ gives us the third angle, and we can proceed to use the formula—

$$\frac{\sin A}{\sin B} = \frac{a}{b}.$$

French.

Last month we dealt with the influence of the tonic accent in its relation to inflections; we will now consider it in relation to derivation. For the sake of brevity we will employ the technical terms—*ultimate* for the last syllable, *penultimate* for the last but one, and *antepenultimate* for the last but two. Now in Latin the tonic accent came on the penultimate if this syllable was long, but came on the antepenultimate when the penultimate was short: *armatūram, acūtum;* but *règulam, òculum.* (*N.B.* French nouns are derived from the accusative of Latin nouns.) Even those of our readers who have made no regular study of Latin have frequent occasion to employ Latin words, and the above rules will be useful in that way, as well as in dealing with French derivation.

1. The chief rule is that the syllable which took the tonic accent in Latin always survives in French: *vestimèntum = vêtement; fàbula = fable.* The tonic accent may thus be regarded as the soul of the word—the imperishable part of it.

2. The next rule is that the syllables that followed the tonic accent either disappeared altogether, or else became simply mute: *cabàllum = cheval; oràculum = oracle.*

3. Every long Latin vowel which preceded the tonic accent remains in French: *immortàlis = immortel; carpentàrius = charpentier.*

4. A short vowel immediately preceding the tonic accent disappears, unless it is the only one before the accent; but a short vowel, more than one syllable, in front of the tonic accent, remains: *sanitàtem = santé.*

Political Economy.

Study Fawcett, Section IV., chap. i. Foreign exchange is carried on to enable the inhabitants of any one country to buy in the cheapest market and sell in the dearest. If a country finds that it can buy more cheaply abroad than at home, it imports; and if it can obtain a higher price for its productions in a foreign country than at home, it exports them. The direction in which goods are conveyed depends upon their *relative* prices, not upon their absolute prices. Thus, if all the commodities in one country had the same relative values as all those in another, there would be no exchange, for the country in which the commodities were cheaper would not desire to import anything from the other; and if it exported some of each of its commodities in exchange for gold, the increase in the quantity of gold and decrease of commodities in the exporting country would bring the prices up to meet the prices in the importing country, where the decrease in the quantity of gold and the increase in the quantity of commodities would cause a fall in prices.

The fact that trade depends on relative prices is best understood by taking an imaginary but definite case. Suppose that in England coal costs 20s. a ton, and corn 40s. per quarter, and that in France coal costs 40s. a ton, and wheat 50s. a quarter: then coal would be exported from England to France, because it is cheaper relatively to corn; and corn would be exported from France to England, because it is cheaper relatively to coal—that is, in France a quarter of corn is worth only one and a quarter tons of coal, while in England it is worth two tons. Suppose a ton of coal to be exported from England: it could be exchanged in France for four-fifths of a quarter of wheat, which would sell in England for 32s., giving a profit of 12s. upon the whole transaction. Again, supposing a French merchant sent over a quarter of wheat which cost him 50s.; then, although he would sell this for 40s., he could obtain in England two tons of coal, which, when conveyed to France, would sell for 80s., thus giving him a profit of 30s. on the whole transaction. For the sake of simplicity we have neglected the cost of carriage, which in each case has to be deducted from the profits; and, of course, trade would only take place when the difference between the relative values of the commodities in the two countries was sufficient to cover the cost of transit, and to leave a margin of profit to the merchant who employed his capital in carrying on the business. The advantages that would accrue from the exchange if coal were absolutely cheaper in England and corn were absolutely cheaper in France are so obvious that we need not dwell upon them.

We have supposed that perfect freedom of exchange existed between the two countries; but this is not the case. Great Britain is the only country which admits foreign produce to her markets on the same terms as her own. This is what is meant by "Free Trade." Confusion often arises in the minds of students owing to the fact that customs duties are imposed upon certain imports. These duties are imposed for the sake of the public revenue, and *corresponding duties are levied on the same class of goods produced at home.* Thus the duty on brandy is imposed to meet the national expenses, and is in accordance with the principles of sound taxation, which, as we shall see later on, require taxes to be levied on luxuries. It is not imposed to induce people to drink home-made whisky, for this spirit has a similar duty on it. The narrow policy of aiding one class by obliging everybody to pay higher prices has long been given up as a serious political principle, although some people would like to enforce it, and proclaim that Britons should buy only British-made articles. This is a false form of patriotism; for if it is our duty, it is obviously the duty of other countries to do likewise, and where would our trade be then? The question of the advantages of free trade must be carefully studied, and the interests of the country as a whole considered in preference to those of a few individuals. We will consider two actual cases as illustrating this point. Some years ago sugar-refining was a very important industry, employing much capital and many hands in Bristol, the east end of London, and in Glasgow. But the Continental nations vied with one another in giving bounties to encourage the sugar industry; consequently our refineries mostly had to close, the capital and labour had to seek another outlet, and much temporary inconvenience was caused. Had it been, therefore, merely a question of supporting our refiners against Continental refiners, protective measures might have been justified. But in the unnatural competition the fortunes of Continental refiners were subscribed for by the Continental consumers of sugar, who are compelled to pay high prices, with the result that the whole of Great Britain is supplied with sugar at a cheap rate; and whereas sugar in France costs about 6d. a pound, we buy it for about 2d. The result is that the English labourer's position is improved, for with the same wages he is able to buy more and to save more. Again, an English engineering firm invited tenders for a particular sort of wire. British firms quoted it at £12 per ton, while a German firm supplied it at £10. This was possible because, owing to the protective tariffs, German consumers are obliged to pay in Germany £14 a ton for the same wire that Germans supply here at £10. We may presume that £12 is about a fair manufacturer's price, and that the German consumer is paying an unnecessarily high price in order that the German manufacturer may supply us at a cheap rate. The latter may benefit, but Germany as a whole is evidently the loser by the amount of the difference between the cost price and the price at which the goods are sold here. Many other examples might be quoted, but enough has been said to show that a country as a whole must lose by protection.

OUR CERTIFICATE COURSE FOR 1903.

For Composition, French, and Arithmetic, see our course for 1902.

Theory of Teaching.

Study chap. v. of the text-book. If possible, read through Herbert Spencer's work on *Education*, in which the fundamental principles of teaching are also fully set out. This chapter deserves careful attention, as so many of the phrases which embody deep thought and important principles tend to become mere "catch words," and are supposed to mean just the opposite of what they do really signify. The student is strongly recommended to study very carefully the important subject of questioning, and to see the appropriate time, manner, and conditions for putting effective questions. But, above all, he is advised to bear in mind that it is far more important to encourage the pupil to put questions than to put them himself. The natural arrangement is for the pupil—the one who is desirous of learning—to

ask the questions, and for the teacher to answer them. The forms of the answers also require careful consideration. The plea for "all answers in complete sentences" is very frequently useless.

ENGLISH LANGUAGE AND LITERATURE.

Read the first Act of *Richard the Third*, and note passages which throw light on the chief characters. The character of Richard is an easy one to make out; that of Clarence comes out best by contrast with Richard's. The scene between Gloucester and Anne is a very fine piece of play-writing, and shows up Richard's character well.

ENGLISH HISTORY.

Finish the Anglo-Saxon period, but leave the events which led up to the Norman Conquest for study in connection with that important event.

GEOGRAPHY.

Study carefully the physical geography of the British Isles.

LONDON MATRICULATION.

JUNE 1902.

"HELPS" FOR THE LATIN PAPERS.

BY C. J. PHILLIPS, M.A.,
Stockwell Pupil Teachers' Centre.

ANSWERS TO TEST PAPER IN GRAMMAR.

1. Echo, *fem.*, "echo;" echūs.
Vās, *neut.*, "vessel;" vāsis.
Vās, *masc.*, "security, bail;" vădis.
Iecur, *neut.*, "liver;" iecoris, iecinoris *or* iocinoris.
Domus, *fem.*, "house;" domūs.
Heros, *masc.*, "hero;" herois.

2.

	Singular.	*Plural.*
N.	Ingens paries.	Ingentes parietes.
V.	Ingens paries.	Ingentes parietes.
Ac.	Ingentem parietem.	Ingentes parietes.
G.	Ingentis parietis.	Ingentium parietum.
D.	Ingenti parieti.	Ingentibus parietibus.
Ab.	Ingenti pariete.	Ingentibus parietibus.

	Plural.	*Singular.*
N.	Tres boves.	Idem mare.
V.	Tres boves.	Idem mare.
Ac.	Tres boves.	Idem mare.
G.	Trium boum.	Eiusdem maris.
D.	Tribus bobus (*or* bubus).	Eidem mari.
Ab.	Tribus bobus (*or* būbus).	Eodem mari.

3. Alterutra soror, *or* Alterutra sororum.
Quis adfuit? Qui vir aut quae femina?
Fuerunt in exercitu ducenta signa, centum milia essedarum, ducenta milia hominum.

4. Bene, audacter, nequam; providentissimus, gracillimus, natu maximus.

5. Fierem, mallem; sepultus sim, morsus sim, lautus sim (*or* lotus sim), pictus sim.
Volo, vis, vult, volumus, vultis, volunt.
Fero, fers, fert, ferimus, fertis, ferunt.
Edo, edis (*or* es), edit (*or* est), edimus, editis (*or* estis), edunt.

	Pres.	*Infin.*	*Perf. Indic.*	*Sup. or p.p.*
6.	Misereor,	miserēri,	miseritus sum,	miseritus.
	Pasco,	pascĕre,	pāvi,	pastum.
	Pendeo,	pendēre,	pependi,	pensum.
	Obliviscor,	oblivisci,	oblitus sum,	oblitus.
	Mĕto,	metĕre,	(messui),	messum.
	Soleo,	solēre,	solitus sum,	solitus.
	Gigno,	gignere,	genui,	genitum.
	Sero,	serere,	sēvi,	sātum (*sow, plant*).
	Sero,	serere,	-serui,	-sertum (*join*).

TEST PAPER IN GRAMMAR FOR THIS MONTH.

1. Decline in full:—(*a*) *Deus, vis, iocus, caelum;* (*b*) *Jupiter omnipotens, feroz elephas.*

2. How are the following words used:—*Prae, ante, sub, palam, penes?*

3. Give the meaning and the principal parts of *orior, ordior; paro, pareo, pario; vendo, venio, veneo.*

4. Give instances illustrating the form and use of distributive numerals in Latin.

5. What participles has a Latin verb? Classify your instances according to tense, voice, and meaning.

Special revision work in accidence for this month.
The irregular verbs of the second and fourth conjugations and the "impersonal verbs."

ANSWERS TO TEST SENTENCES SET LAST MONTH.

1. (*a*) *Oportuit te statim imperatori parere*, "It behoved you to obey the general at once."
(*b*) *Debuisti statim imperatori parere*, "You owed to obey the general at once."
(*c*) *Statim imperatori parendum fuit a te*, "Obeying the general at once was by you."

2 *Saepe Cicero dicebat se mirari cur philosophi poetas, poetae philosophos contemnerent.* (*Contemnerent* is the verb in a dependent question.)

3. *His rebus nuntiatis, dux Gallorum constituit, omnibus vici aedificiis incensis, exercitum trans Rhenum traiicere antequam Romani proficisci possent.* (*Possent* is subjunctive, because it expresses part of what the Gallic leader thought.)

4. *Nisi tu servum quo ires certiorem fecisses, nemo te ex urbe excessisse cognovisset.* (The whole sentence is an "unrealised conditional" in past time, and therefore the two chief verbs are put into the pluperfect subjunctive. *Ires* is subjunctive, because it is the verb in a dependent question.)

5 (*a*) *Inimicis parcendum, amicis subveniendum est a nobis* (or *amici adiuvandi sunt nobis*).
(*b*) *Oportet nos inimicis parcere, amicis subvenire* (or *amicos adiuvare*).
(*c*) *Debemus* instead of *oportet nos.*
(*N.B.*—Be sure you understand why you must not say, *Inimici parcendi sunt nobis.*)

6. *Vereor* (or *timeo*) *ut veniat, si quando habeantur comitia consularia cognoverit.*
(*N.B.*—*Timeo ne veniat* means, "I fear lest he will come;" *timeo ut veniat* means, literally, "I fear how he may come"—that is, "I fear he will *not* come." *Cognoverit* is perfect subjunctive, "If he has learnt." *Quando*, not *cum*, and *habeantur*, not *habentur*, because the clause is a dependent question, and so must begin with an interrogative word (*quando*), and must have the verb in the subjunctive.)

7. (*a*) *Tantus hodie est hostium numerus, quantum unquam esse sensi*, "So great to-day is the number of our enemies, as (great) I have ever perceived (it) to be."
(*b*) *Tot hodie sunt hostes quot unquam ego sensi*, "So many are our enemies to-day, as (many) I have ever noticed."
(*Quot* is here in the accusative case, just as *quantum* was in (*a*); but *tot* and *quot* are indeclinable numeral adjectives—that is, they cannot be inflected to show case, number, or gender.)

8. (*a*) *Non is est qui talia faciat*, "He is not he who should do such things." (What would *qui talia facit* mean?)
(*b*) *Non talis est qualis res eiusmodi facit*, "He is not such as does things of that kind."

9. (*a*) *Si ego certo scirem te tribunum factum iri paeniteret me consilii mei*, "If I knew for certain (which I don't) that there was a going to make you tribune, it would repent me (which it doesn't) of my decision." Or the English might mean:
(*b*) *Si ego certo sciam.....paeniteat me*, etc., "If I were to know (at some vague future time).....then it would repent me," etc.

10. (*a*) *Num quis dubitat eum, si licuisset ei adesse, consules interfecturum fuisse?*
(*b*) *Num quis dubitat quin, si adesse licuisset, consules interfecisset?*

SENTENCES FOR THIS MONTH.

1. Neither before, nor during, nor after his departure from the city would he say anything.
2. But for Cæsar's refusal to set sail before the rest of the ships came up, it would already have been all over with the Britons.
3. If you think it your duty to enjoy every pleasure, why do you not believe that I ought to read what I like?
4. Do you mean to say that, after reading that letter you have there, you still hope to be chosen aedile?
5. The consuls are not the men ever to be persuaded to leave Rome.
6. Surely these are not the same men as we saw yesterday.
7. I wish I did not know who killed the dog.
8. After lunch they used to talk till night came on.

Answers to Tests on Cicero Set Last Month.

Chapter xiii.

1. (*a*) "And (that) Manius Curius and Titus Coruncanius, on hearing this from him, used to wish that the Samnites and Pyrrhus himself might be persuaded of it, so that they might be the more easily conquered when they should have given themselves up to pleasures."

(*b*) "But it goes without feasts, and loaded tables, and constant draughts (of wine). It, therefore, is also without drunkenness, and indigestion, and sleeplessness. But if we must make some concession to pleasure, as we do not withstand its allurements without difficulty—for Plato admirably names pleasure 'the bait of evil things,' seeing that, in fact, men are caught by it just as fishes are by a hook—though old age does go without extravagant feastings, yet it is capable of being cheered by reasonable festivities."

(*c*) "For I used not to measure the charm of even banquets by the pleasures of the body more than by the intercourse with one's friends and by conversations. For rightly did our ancestors call the sitting together of friends at feasts *convivium*, because it involved companionship in living; better (did they name it) than do the Greeks, who call it sometimes *compotatio* (that is, drinking together), and sometimes *concenatio* (dining together); so that they appear to approve most of that (point) which is of least importance in that kind of thing."

2. (*a*) *Philosophus quidam est Athenis, qui omnia quae faciamus ad voluptatem esse referenda docet.*

(*b*) *Dixit se puerum saepe C. Duillium, qui primus Poenos classe devicisset, a cenis redeuntem vidisse.*

Chapter xiv.

1. (*a*) "As for me, the offices ordained by our ancestors delight me; and that conversation which, after the manner of our ancestors, is instituted from the top of the table during the wine; and the cups, small and filled by driblets, as is the case in the symposium of Xenophon, and the cooling (of the wine) in summer, and in turn either the sun or a winter fire (to warm it when necessary). And these things I am in the habit of carrying out among the Sabines, too, and every day I help to make up a banquet of my neighbours, which we prolong far into the night as much as we can by varied conversation."

(*b*) "Just as he who looks on in the front row is more delighted with Ambivius Turpio, yet he too is delighted who (sits) in the last row. So youth, gazing at pleasures from close at hand, is perhaps more enchanted; yet old age too, looking at them afar off, is delighted as much as is sufficient."

(*c*) "As to Marcus Cethegus, whom Ennius rightly called 'the marrow of persuasiveness,' with what great enthusiasm used we to see him practising himself in speaking when an old man! What pleasures, then, of feasts and games or mistresses are to be compared with these? And these things, indeed, are the pursuits of learning. And truly, for the wise and well regulated (in disposition), they grow side by side with age, so that that is a fine saying of Solon's, which he utters in a certain verse, as I said before, how that he grew older learning many things day by day; and assuredly there can be no pleasure greater than this one of the mind."

2. *Restant*, third person plural, pres. indic. of *resto, -stare, -stiti.*

Rorantia, nom. plural, neut., pres. partic., from *roro, -are, -avi, -atum.*

Dimetiendi, gen. sing. neut., gerundive of *dimetior, -iri, -mensus.*

3. *Nonne putas gratiam senectuti a nobis esse habendam, quae nobis potionis et cibi aviditatem sustulerit, sermonis auxerit?*

Chapter xv.

1. (*a*) "Although, for my part, it is not merely the fruit but also the power and the constitution of the earth that charms me. Which, when it has received the sown seed in its softened and subdued bosom, first keeps it hidden, from which fact the harrowing which brings about this (result) is named; then, when it is warmed by heat and its own compression, it expands it, and lures forth the greenness growing from it, which, leaning on the fibres of the roots, gradually grows up, and, erect upon a jointed stalk, is shut in like a something of tender age in a sheath; and when it has emerged from this (sheath), it pours forth the fruit of corn arranged in order, and is protected against the pecks of the smaller birds by a rampart of beards."

(*b*) "Thus, in the beginning of spring, in those twigs which are left, there rises up at the joints, so to speak, of the branches, that which is called a bud; and from this the grape rising shows itself, which, growing by the moisture of the earth and the warmth of the sun, is at first quite bitter to taste, and then, as it ripens, grows sweet, and, clothed in its leaves, does not, on the one hand, lack moderate warmth, and, on the other, keeps off the too strong rays of the sun; and what can be either more delightful in fruit or more beautiful in appearance than this?"

2. *Viviradices*, nom. plural, from *viviradix* (*f.*).

Gustatu, supine in *-u*, from *gusto, -are, -avi, -atum* (that is, abl. case, from a verbal noun *gustatus, -us*).

Sollertius, acc. sing. neut., from *sollertior*, comparative of *sollers.*

3. *Procreet* is a subjunctive of cause or consequence; *quae..... procreet*, "which is of such a kind that it produces."

Proferam, deliberative subjunctive; *quid.....proferam?* "why should I bring forward?"

Scriberet, concessive, "although he wrote."

Chapter xvi.

1. (*a*) "When the Samnites had brought a great weight of gold to Curius, who was sitting by his hearth, they were rejected; for he said that, not having gold, but commanding those who had it, seemed to him to be splendid."

(*b*) "Indeed, in my opinion, I do not know that any can be more blessed, and that not merely from (the point of view of) duty—since the cultivating of the lands is beneficial to the human race as a whole—but both because of the delight which I spoke of, and from the abundance and plenty of all those things which belong to the support of man's life and the worship also of the gods; so that, since some people do desire these things, we can return to favour with pleasure once more."

(*c*) "Let them then keep to themselves arms, horses, spears, club, tennis-ball, hunting, and racing; to us old men let them leave out of their many amusements the knucklebones and the dice; and let that question itself be as it shall please them, since old age is able to be happy without these things."

2. *Aranti*, dat. sing. masc. (agreeing with *Quintio*), from *arans*, pres. partic. of *aro, -are, -avi, -atum.*

Referta, nom. sing. fem., from *refertus, -a, -um* (agreeing with *cella*); *refertus* is past partic., from *refercio, refercire, refersi, refertum.*

Conditiora, acc. neut. plur. (agreeing with *haec*), from *conditus*, past partic. of *condio, -ire, -ivi, -itum.*

3. (*a*) *Mihi quidem non aurum habere sed aurum habentibus imperare praeclarum esse videtur.*

(*b*) *Cicero dicit araturo Cincinnato eum dictatorem esse factum nuntiatum esse.*

Tests for this Month.

Chapter xvii.

1. Translate:—
   (*a*) *Atque ut intellegatis.....ostendisse.*
   (*b*) *M. quidem Valerium.....honorum fuit.*
2. Parse:—*dimensa, praeditum, pluris.*
3. Translate into Latin:—
   (*a*) Lysander said that Cyrus was rightly called blessed, since fortune was joined to his personal virtues.
   (*b*) If old age were honoured, it would be of more value than all the pleasures of youth.

Chapter xviii.

1. Translate:—
   (*a*) *Haec enim ipsa.....observantur.*
   (*b*) *Quibus qui splendide.....actu corruisse.*
   (*c*) *Sic se res habet.....viatici quaerere.*
2. Give Latin for:—
   (*a*) The Athenians know what is right, but they won't do it.
   (*b*) They used to say that the more money we had the less pleasure would we have; but I did not believe them when they said this.

Chapter xix.

1. Translate:—
   (*a*) *Neque enim histrioni.....honesteque vivendum.*
   (*b*) *Itaque adulescentes.....esse venturus.*
2. Parse:—*aliquo, viveretur, plaudite, partorum.*
3. Translate into Latin:—
   I do not believe that any one, however young, is so stupid as to be quite confident that he will live till evening.

Chapter xx.

1. Translate:—
   (*a*) *Sed vivendi.....facile divellitur.*
   (*b*) *Sunt puerilitae.....mortis affert.*
2. Write a short note on:—*faxit, consequatur, obstruere.*
3. Put into Latin:—
   Do not forget that you have to die, and that it is uncertain whether it be this very day or not.

OUR QUERY COLUMN.

RULES.

1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the name and address of the correspondent, and the *coupon* which appears on the back wrapper of the current number of the Journal.
3. CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

Eosin.—A spectroscope is arranged as sketched (Fig. 1). The red end of the spectrum is seen at R (say), and the blue end by moving the telescope towards B. Why is this order not reversed, since, when the telescope is focused on distant letters on a blackboard (for example, AB), these appear reversed (in the order BA)?

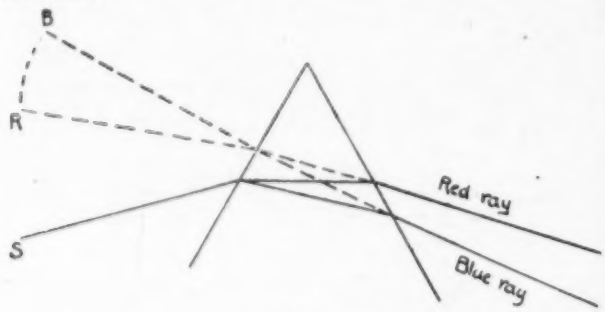


FIG. 1.

Your difficulties will disappear if you merely look through a prism, without using any telescope or collimator, at a line of light. It will be seen that by refraction through the prism, the slit S is drawn out into a coloured image BR (Fig. 2), the blue being at B, and the red at R. On

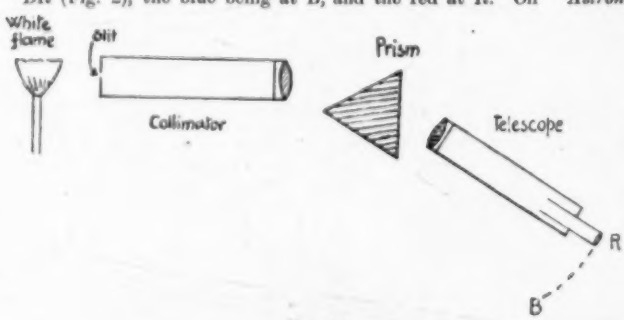


FIG. 2.

comparing Fig. 2 with Fig. 1, it will be seen that the telescope reverses the order of the colours in the image, just as it does letters on the blackboard.

Demetia.—Suitable books for the Board of Education's examinations in the subjects you mention are:—

1. *Practical Plane and Solid Geometry.—Solid Geometry*, by Harrison and Baxandall (Macmillan, 4s. 6d.); and Castle's *Practical Mathematics* is useful for reference.

2. *Geology.—Intermediate Text-Book of Geology*, by Charles Lapworth, F.R.S., published by Blackwood and Sons; or *The Student's Lyell*, edited by J. W. Judd, F.R.S., published by John Murray. For practical work, Grenville Cole's *Aids in Practical Geology* will be particularly useful.

3. *Biology.—Text-Book of Biology*, by H. G. Wells, published by Clive and Co.

4. *Spherical Astronomy.*—No suitable book is published, but Lockyer's *Elementary Lessons in Astronomy*, published by Macmillan, and Ball's *Story of the Heavens*, may be used.

For stereographic projection, see reply to C. D.

Charles Davis.—A very useful map of the stars for class teaching is published by T. Nelson and Sons.

The Observer's Atlas of the Heavens, by W. Peck, published by Gall and Inglis, will probably answer your purpose. It is of large size, and contains maps of the Northern and Southern Hemispheres.

A small but good star atlas is R. A. Proctor's *New Star Atlas*, published by Longmans.

A good star map was given with the January number of THE PRACTICAL TEACHER in 1899. This would probably be useful, as it is large.

There is no book at present published which covers the syllabus of the Board of Education in spherical astronomy. Most of the advanced books treat the subject of stereographic projection in too mathematical a manner for class work. You will find some account of a graphic method of treating it (and this is really what is wanted for school work) in a paper by Mr. S. A. Saunders, published in the *Journal of the British Astronomical Society*, Vol. VII. There is also a further simplification of the treatment in last year's volume of the same journal.

Constant Reader.—In a school the average attendance for the four quarters is respectively 94, 95, 97·5, 96; and the number present at all has been 100.

In a year during which there have been 6 weeks' holiday and 10 occasional holidays, what is the average number of days' instruction received by each present at all? Assume that there are five school days weekly.

The average attendance for the year is

$$\frac{94 + 95 + 97{\cdot}5 + 96}{4} = \frac{382{\cdot}5}{4} = 95{\cdot}625.$$

Instruction has been given on $\{52 \times 5 - (30 + 10)\}$ days = 220 days.

Then, as 100 : 95·625 :: 220 : the average number of days' instruction received by each present at all.

Hence the average number of days' instruction received by each present at all = $95{\cdot}625 \times 2{\cdot}2 = \underline{210{\cdot}375}$.

Kindly refer to Rule 1.

Monk Bretton.—Trace the curves represented by the equations (i.) $y = x^3$; (ii.) $y^2 = 4x^3 + x^2$; (iii.) $y = (x - 2)(x - 4)^2$. Find the positions of the points of inflexion, if any, at which the curves cross their tangent lines. (London B.Sc., 1899.)

(i.) $y = x^3$.

(1) On changing signs of x and y the equation of the curve remains unaltered; hence there is symmetry in oppo-

site quadrants. (2) There being no absolute term, the curve passes through the origin. (3) The tangent at the origin is $y = 0$. (4) $\frac{d^2y}{dx^2} = 6x$; hence the points of inflexion lie on the line $x = 0$—that is, the origin is a point of inflexion. The curve has therefore the form of Fig. 1, which represents the graph of the curve between the limits $x = -1$ and $x = 1$.

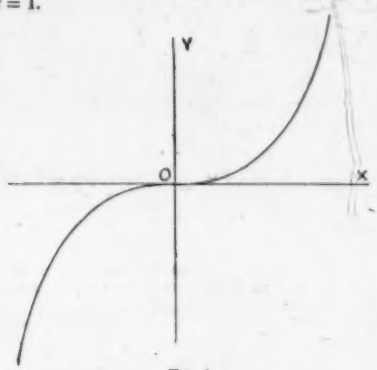


Fig. 1.

(ii.) $y^2 = 4x^2 + x^3$.

(1) The curve is symmetrical about the axis of x. (2) The curve passes through the origin. (3) The curve cuts the axis of x again in the point $(-4, 0)$. (4) The curve lies wholly to the right of the tangent at $(-4, 0)$—that is, the line $x + 4 = 0$. (5) The tangents at the origin are given by the equation $y^2 = 4x^2$; hence the curve has a node at the origin. It follows that the curve consists of an oval and an infinite branch. Fig. 2 is a graph of the curve between the limits $x = -4$ and $x = 2$.

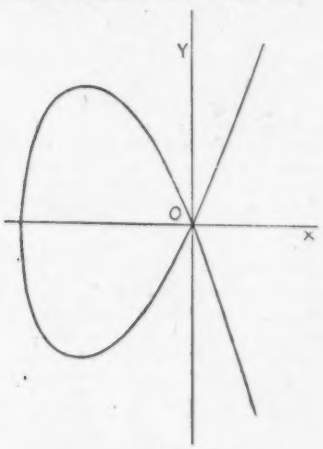


Fig. 2.

On differentiating with respect to x, we find that $\frac{d^2y}{dx^2}$ becomes zero when $x = -5\frac{1}{3}$. Hence the points of inflexion lie on the line $x = -5\frac{1}{3}$. It follows from (4) that the curve has no real points of inflexion.

(iii.) $y = (x - 2)(x - 4)^2$.

Transferring the origin to the point (4, 0), the equation becomes $y = (x + 2)x^2$.

(1) It is obvious that the axis of x touches the curve at the new origin, and also cuts the curve in the point $(-2, 0)$.

(2) Differentiating with respect to x, we obtain

$$\frac{dy}{dx} = 3x^2 + 4x, \text{ and } \frac{d^2y}{dx^2} = 6x + 4.$$

Hence the y ordinate has a maximum value when $x = -\frac{4}{3}$, and a minimum value when $x = 0$.

(3) Since $\frac{d^2y}{dx^2} = 6x + 4$, we have $\frac{d^2y}{dx^2} = 0$ when $x = -\frac{2}{3}$. Hence the point $(-\frac{2}{3}, \frac{16}{27})$ is the point of inflexion of the curve.

The form of the curve is therefore that of Fig. 3, which represents the graph of the curve between the limits $x = -2{\cdot}25$ and $x = 0{\cdot}5$.

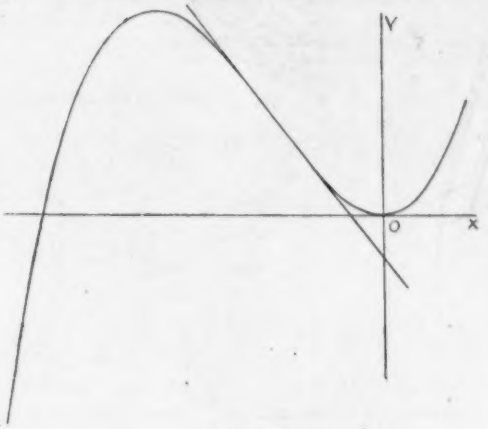


Fig. 3.

Explain how the principle of virtual work may be applied to find the position of equilibrium of a framework of rods hinged freely together and acted upon by given forces. Explain also how the principle may be applied to determine the stress at one of the hinges.

This is all book work. See Routh's *Statics*, Arts. 229–233.

Amateur (Grahamstown, Cape Colony).—Is there any real difference between potential difference and electro-motive force? In two closed circuits there is a mutual potential. Is this due solely to the amount of current passing through each, and to their relative positions to one another? How are we to find the difference in potential between the two circuits, and would it be expressed in volts?

When energy is introduced into, or removed from, an electric circuit, between two definite points, then there is a potential difference between those points. We measure the potential difference by the amount of energy appearing or disappearing per second, for each unit of current flowing between the points. Two cases now arise. In one, when the current flows in a particular direction, energy is added to the circuit, whilst a reversal of the current causes energy to disappear from the circuit. In this case, the potential difference, which is reversed by reversing the current, is termed an E.M.F. A familiar instance is afforded by an electric cell. When a current flows through it in one direction, energy is added to the circuit, this energy being derived from the potential energy stored in the zinc (or equivalent) electrode of the cell, by means of a chemical change. When the current is reversed, zinc is removed from solution, and deposited on the electrode, so that energy is subtracted from the circuit, and converted into the potential form, and stored in the zinc. Hence the expression E.M.F. of the cell. When a reversal of the current produces no alteration in the energy change which occurs between the two points, we merely say that there is a potential difference between the points. A familiar instance is afforded by the work done in heating a conductor by the electric current.

Thus potential difference is a term more general than E.M.F. In general, we may say that the energy change occurring between two points in a circuit can be expressed by $EC + C^2R$, where E is the E.M.F. between the points, C is the current, and R is the resistance. The first term is reversed by reversing C; the second term remains constant as long as C has a constant numerical magnitude, irrespective of its sign.

The term "mutual potential of two closed circuits" is very loose. The energy of the magnetic field due to both coils will in general be different from the sum of the energies of the fields due to the coils taken singly. The energy possessed by the coils in virtue of their proximity to each other might be termed their "mutual potential energy." It would be measured in ergs, and would depend on the currents in the coils, together with the areas and relative positions of the latter. There would be no question of difference of potential between the coils. We could obtain the sum of the energies due to the magnetic fields of the

coils taken singly, and then of the two in the position specified. The difference between these two quantities would give the mutual energy of the coils.

Moline.—In a triangle ABC, prove that

$$\begin{vmatrix} a, & b, & c \\ \sin^2\frac{A}{2}, & \sin^2\frac{B}{2}, & \sin^2\frac{C}{2} \\ \cos^2\frac{A}{2}, & \cos^2\frac{B}{2}, & \cos^2\frac{C}{2} \end{vmatrix} = \frac{(a+b+c)(b-c)(c-a)(a-b)}{2abc}.$$

(Cambridge Entrance.)

$$\begin{vmatrix} a, & b, & c \\ \sin^2\frac{A}{2}, & \sin^2\frac{B}{2}, & \sin^2\frac{C}{2} \\ \cos^2\frac{A}{2}, & \cos^2\frac{B}{2}, & \cos^2\frac{C}{2} \end{vmatrix}$$

$$= \begin{vmatrix} a, & b, & c \\ \left(\sin^2\frac{A}{2}+\cos^2\frac{A}{2}\right), & \left(\sin^2\frac{B}{2}+\cos^2\frac{B}{2}\right), & \left(\sin^2\frac{C}{2}+\cos^2\frac{C}{2}\right) \\ \cos^2\frac{A}{2}, & \cos^2\frac{B}{2}, & \cos^2\frac{C}{2} \end{vmatrix}$$

$$= \begin{vmatrix} a, & b, & c \\ 1, & 1, & 1 \\ \cos^2\frac{A}{2}, & \cos^2\frac{B}{2}, & \cos^2\frac{C}{2} \end{vmatrix}$$

$$= a\left(\cos^2\frac{C}{2}-\cos^2\frac{B}{2}\right)+b\left(\cos^2\frac{A}{2}-\cos^2\frac{C}{2}\right)+c\left(\cos^2\frac{B}{2}-\cos^2\frac{A}{2}\right)$$

$$= s\left\{a\left(\frac{s-c}{ab}-\frac{s-b}{ca}\right)+b\left(\frac{s-a}{bc}-\frac{s-c}{ab}\right)+c\left(\frac{s-b}{ca}-\frac{s-a}{bc}\right)\right\}$$

$$= s\left\{\frac{s-c}{b}-\frac{s-b}{c}+\frac{s-a}{c}-\frac{s-c}{a}+\frac{s-b}{a}-\frac{s-a}{b}\right\}$$

$$= \frac{a+b+c}{2abc}\left\{\begin{matrix}(s-c)ca-(s-b)ab+(s-a)ab-(s-c)bc \\ +(s-b)bc-(s-a)ca\end{matrix}\right\}$$

$$= \frac{a+b+c}{2abc}\left\{(s-c-s+a)ca+(s-a-s+b)ab+(s-b-s+c)bc\right\}$$

$$= \frac{a+b+c}{2abc}\left\{(a-c)ca+(b-a)ab+(c-b)bc\right\}$$

$$= \frac{a+b+c}{2abc}\left\{(b-c)(c-a)(a-b)\right\}.$$

Alpha.—Show how to divide a given angle into two parts whose sines shall be in a given ratio.

If the given angle be 120°, and the given ratio 2 : 1, what are the parts?

(University Preliminary in Arts, St. Andrews, 1901.)

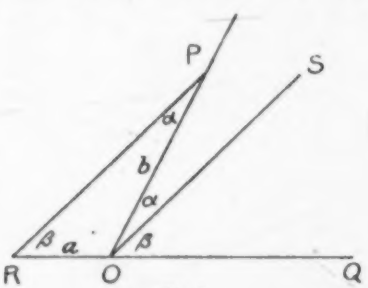


Fig. 1.

Let POQ (Fig. 1) be the given angle, and let $a : b$ be the given ratio. In QO produced take any length OR to represent a, and from OP cut off OP, such that OR : OP shall be equal to $a : b$. Join RP, and draw OS parallel to RP. Then OS divides the angle QOP into two parts, such that sin POS : sin SOQ :: $a : b$.

By Euclid I. 29, the angle SOQ is equal to the angle PRO, and the angle POS is equal to the angle OPR.

Again, since the sides of a triangle are proportional to the sines of the opposite angles, we have

$$\begin{aligned} \text{sin OPR} : \text{sin PRO} &:: \text{OR} : \text{OP} \\ &:: a : b. \\ \therefore \text{sin POS} : \text{sin SOQ} &:: a : b. \end{aligned}$$

When ∠ POQ is 120° (Fig. 2), we have ∠ POR = 60°. Taking OR and OP, such that OP : OR :: 2 : 1, and noting that ∠ POR is equal to one of the angles of an equilateral

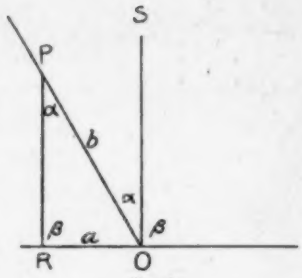


Fig. 2.

triangle, it follows that PO is the side, and RO half the side, of an equilateral triangle. Hence ∠ PRO is a right angle, and the angle POQ is divided by OS, so that ∠ POS = 30°, and ∠ SOQ = 90°.

Desdichado.—If $a^2+b^2=c^2$, then $(2a+b+2c)^2+(a+2b+2c)^2=(2a+2b+3c)^2$. Hence show how to find an indefinite number of right-angled triangles whose legs differ by unity.

(*Mathematical Gazette.*)

Let $2(a+b+c)$ be denoted by z.

Then
$$\begin{aligned} &(2a+b+2c)^2+(a+2b+2c)^2 \\ &=(z-b)^2+(z-a)^2 \\ &=2z^2-2(a+b)z+a^2+b^2 \\ &=2z^2-2(a+b)z-2cz+2cz+a^2+b^2 \\ &=2z^2-2(a+b+c)z+2cz+a^2+b^2 \\ &=2z^2-z^2+2cz+a^2+b^2 \\ &=z^2+2cz+c^2 \\ &=(z+c)^2 \\ &=(2a+2b+3c)^2. \end{aligned}$$

If $a=3$, $b=4$, $c=5$, we have $a^2+b^2=c^2$. Hence, by the preceding formula, we have

$$\begin{aligned} &(2\times3+4+10)^2+(3+2\times4+2\times5)^2 \\ &=(2\times3+2\times4+3\times5)^2, \end{aligned}$$

or $20^2+21^2=29^2$.

Next, taking $a=20$, $b=21$, $c=29$, we obtain from the formula the following relation—

$$119^2+120^2=169^2.$$

Again, taking $a=119$, $b=120$, $c=169$, we obtain the relation $696^2+697^2=985^2$.

Next take $a=696$, $b=697$, $c=985$, and so on.

We thus obtain an indefinite number of rational right-angled triangles whose legs differ by unity.

Anshi.—If $a+b+c+d=0$, prove that

$$abc+bcd+cda+dab=\sqrt{(bc-ad)(ca-bd)(ab-cd)}.$$

The postulated relation is true if

$$(abc+bcd+cda+dab)^2=(bc-ad)(ca-bd)(ab-cd);$$

that is, if

$$\begin{aligned} &a^2b^2c^2+b^2c^2d^2+c^2d^2a^2+d^2a^2b^2+2abcd(bc+cd+da+ab) \\ &=a^2b^2c^2+b^2c^2d^2+c^2d^2a^2+d^2a^2b^2-abcd(a^2+b^2+c^2+d^2). \end{aligned}$$

And this is the case; for $(a+b+c+d)^2=0$.

$$\therefore a^2+b^2+c^2+d^2+2(ab+bc+cd+da)=0.$$

$$\therefore 2(bc+cd+da+ab)=-(a^2+b^2+c^2+d^2).$$

W. W. P.—What is the value of British silver if the par of exchange between the shilling and the dollar is 20s. = 4·7345 dollars, if one dollar weigh 412½ grains and is $\frac{9}{10}$ fine, and one pound troy standard silver $\frac{37}{40}$ fine is coined into 66 shillings?

(Cusack's *Arithmetic.*)

The weight of fine silver in 4·7345 dollars is

$$4\cdot7345\times\frac{9}{10}\times\frac{412\cdot5}{480}\text{ ounces troy.}$$

This is valued at 20s.

Therefore $\frac{40}{37}\times4\cdot7345\times\frac{9}{10}\times\frac{412\cdot5}{480}$ ounces troy of British standard silver is valued at 20s.

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PHYSIOGRAPHY.

(ADVANCED AND HONOURS.)

The Leonids.—Advices from many stations in the U.S.A. report more or less brilliant displays of the Leonids as having been seen on the nights of Thursday and Friday, November 14 and 15. A steamer from New Orleans reports having seen a great shower near Cape Hatteras early on Friday morning, November 15. The only night on which the sky was at all favourable in London was Thursday, November 14, and on that occasion continual watch was kept by three observers at the Solar Physics Laboratory, South Kensington, from 11 p.m. to 4 a.m. A few meteors were seen, numbering from twenty to thirty, but nothing in the shape of a definite shower. Many of the shooting stars seen were very brilliant, but those treated as being Perseids or Taurids were as numerous as those decidedly radiating from the Sickle of Leo, so that probably there war nothing more than is to be seen on any good night for the same interval of time.

Sun Spots and Magnetic Disturbance.—Mr. W. Ellis contributes an interesting note on this important subject. From a survey of the general features of terrestrial magnetic movements, he arrives at the definite conclusion that though differing in its mode of expression at different localities, an electric shock seems to reach the whole earth simultaneously, the consequent presumption being that it has come from without. After calling to mind the established fact that magnetic disturbance is more marked at or near periods of sun-spot maximum, he reminds us of the diurnal variation, and then draws attention to the well-ascertained and important excess of magnetic and auroral phenomena near the equinoxes over those occurring near the solstices. At the equinoxes the whole earth comes under the sun's influence, whereas at the solstices a portion remains in the shadow. The displays of aurora also follow the same variation to a remarkable degree.

Balloons and Air Temperature.—All the international balloon ascents which took place in Europe on the morning of December 5, 1901, were made in an extensive area of high barometric pressure, the centre of which lay over Germany. Two recording balloons were sent up from Trappes, near Paris. One reached 14,380 metres, when a temperature of – 72·9° was recorded, the ground temperature at the same time being – 1·1°. The other reached 14,900 metres, the lowest temperature being – 72·9°, the ground being at – 3°. The Strasburg balloon rose 6,580 metres. The lowest temperature recorded was – 30·5°, the ground being at – 2°. From Berlin two recording balloons were sent up 7,634 metres. Whilst the ground was at – 5·4°, the balloon thermometer sank to – 38·7°. At 9,606 metres the temperature was – 52·8°, with the ground at – 4°. Two manned balloons also ascended. From Vienna – 40° was recorded at 6,920 metres, when the ground was at 1°. From Pavlovsk, near St. Petersburg, the greatest height attained was 3,120 metres. The minimum temperature was – 14·7°, when the ground was at – 11°. Kites were also sent up from Blue Hill Observatory by Mr. Retch in the afternoon, when temperatures of – 9·9° at 1,343 metres and – 9° at 800 metres were recorded, the kites remaining up for two hours.

Fahrenheit's Thermometer.—Sir Samuel Wilks states that Newton was the originator of this irrational system of heat registration. Sir Isaac took 12 as most convenient for the heat of the body, thus dividing the space between freezing point and body heat into twelve parts, and then, taking the boiling point of water as about three times the temperature of the body, he called this point 30.

Fahrenheit improved upon this by the simple expedient of dividing each degree into two, and took the temperature of ice and salt as his zero, from which he counted his 24° for body heat, which thus made 8° as the point of freezing, and boiling point 53°, the points now being: freezing, 8°; body heat, 24°; and boiling water, 53°—which was really the scale Newton modified as indicated. After this, to ensure greater delicacy, Fahrenheit determined to divide each degree into four parts, which gives us the thermometer as now in use. "It may be stated," says the author, "that Sir Isaac Newton was well aware that blood heat was higher than that which he obtained by placing the thermometer under the arm to measure body heat." This statement of Sir Samuel puts quite a different complexion upon the origin of the Fahrenheit thermometer and scale.

CHEMISTRY.

(ADVANCED AND HONOURS.)

BY T. CARTWRIGHT, B.A., B.SC.

Electrolysis of Molten Lead Iodide and Chloride: Faraday's Law.—Fused lead iodide at temperatures varying from 440° to 800° was electrolysed by a current of 24 volts and 1 to 2 ampères. The amount of lead separated at the lowest temperature is only about 90 per cent. of that which the current should form, and varies greatly in different experiments. As the temperature rises the yield becomes smaller. Faraday assumed that, during the course of the electrolysis, lead tetraiodide (PbI_4) was formed; but Herr Gustav Auerbach, who has carefully examined the products, finds no evidence in favour of this view.

In the electrolysis of lead chloride also, the quantity of lead separated falls short of the possible amount. Determination of the quantity of chlorine formed proves conclusively that the carbon electrodes (and to a slight extent the undecomposed salt) absorb chlorine, and consequently the evolution of the chlorine depends upon the duration of the electrolysis. After the process has gone on for some time, and the carbon has become saturated, the quantity of chlorine liberated is almost exactly (above 99 per cent.) equal to the amount required by Faraday's law. This is the first time that Faraday's law has been proved for the anode in the case of a molten salt.

Lorenz has suggested that the formula $a = 100e'/e$ represents the yield of the current (a), where e is the polarisation of the molten salt, and e' the depolarised value of the same. During the above experiments the polarisation was also determined, and it has been found that Lorenz's formula, although not rigorously exact, gives approximate values. When the lead chloride is mixed with lead oxide, the yield is precisely the same as when fused lead chloride alone is used, but no chlorine or oxygen is evolved.

During the electrolysis a metallic "cloud" is given off from the cathode, and spreads through the fused mass. As it comes near the anode it combines with the free chlorine there, and in this way gives rise to the irregularities in the amount of metal deposited, since the amount dissipated as cloud must vary greatly with slight modifications of external circumstances. The "cloud" was examined, and it was proved that it is not formed of solid particles, but is a true solution of the metal in the fused salt, which fact is confirmed by the circumstance that metallic cadmium may be crystallised from its fused chloride.

Coal-Gas.—The composition of coal-gas may now be stated, as its chief constituents are now familiar to the student. These

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are divided into three classes, as follows:—(1) diluents; (2) illuminants; (3) impurities.

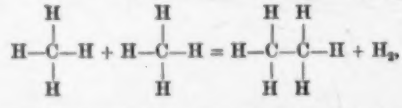
Composition of Coal-Gas.

Diluents	Hydrogen (H)	45·58 per cent.
	Marsh-gas (CH_4)	34·90 ,,
	Carbon monoxide (CO)	6·64 ,,
Illuminants	Ethylene (C_2H_4), Acetylene (C_2H_2) and similar hydrocarbons	6·46 ,,
Impurities	Sulphuretted hydrogen (H_2S)	0·29 ,,
	Nitrogen (N)	2·46 ,,
	Carbon dioxide (CO_2)	3·67 ,,
		100·00 ,,

Preparation.—Everybody is familiar with the simple experiment of filling the bowl of a clay pipe with small pieces of coal, of covering the mouth of the bowl with a protecting capsule of clay, after which the bowl is placed in a fire and heated, whereby a stream of thick yellowish vapour is caused to flow from the stem of the pipe. This vapour contains the coal-gas, together with many impurities to be got rid of, which is a very important part of the work of the gas manufacturer. In the gas works the clay pipe is replaced by a fire-clay-lined retort shaped like a ∩, which is sealed by means of a closely-fitting iron plate, heated below by coke fires, and provided with upright exit pipes. The impure vapour, upon emerging from the retort, is led into a wide pipe containing water, known as the **hydraulic main.** Here much of the tarry matter is condensed, and the stream passes up to the **atmospheric condensers,** which are curved pipes containing water, and exposed to the air. Here more of the tarry and watery products condense. From both the hydraulic main and the atmospheric condensers the tar is collected into the **tar-well.** The gas next passes into the **scrubbers,** which are a series of vessels containing coke, and down which a fine spray of water is constantly being blown, whereby the last traces of tar and some of the volatile sulphur vapours, formed from the sulphur always present in coal, are removed. From the scrubbers the gas passes on to the **purifiers,** a further series of vessels packed with trays of lime or oxide of iron, the effect of which is to absorb the sulphuretted hydrogen and other sulphur compounds with which the gas is still charged. The gas is now ready for consumption, and is passed on to the gas-holders, whence it is delivered to the mains. (For diagram and more detailed description, see Cartwright's "*Section Two*" *Physiography.* London: Thomas Nelson and Sons.)

Products of the Destructive Distillation of a Ton of Newcastle Coal.—10,000 cubic feet of gas; 110 to 120 lbs. of tar; 20 to 25 gallons of watery liquid; 1,500 lbs. of coke.

Hydrocarbons.—In marsh-gas, olefiant gas, and acetylene we have three bodies, consisting of carbon and hydrogen in combination, and called on this account hydrocarbons. Such compounds are extremely numerous, and even more numerous still are their derivatives; indeed, organic chemistry, which is by far the more important and considerable branch of the science of chemistry, is devoted exclusively to the study of these carbon compounds. Why is it that these compounds are so exceedingly numerous? It is reasonable to suppose that there is some peculiarity in the carbon atom that accounts for this superabundance of carbon-containing bodies; and such is truly the case, for the atoms of carbon have a power of combining with one another that is not possessed by those of any other element. For example, one molecule of marsh-gas or methane will combine with another molecule of the same substance to form a new body, which in turn will combine with another molecule of marsh-gas to form another new body, and so through many additions of molecule after molecule of methane. Moreover, it can be shown that this building up of more complex hydrocarbons is entirely due to the affinity of the carbon atoms. The process may be understood from the following—



where it will be seen that one atom of carbon links itself on to another atom of carbon, the hydrogen being eliminated. This is equivalent to saying that CH_2 is added to the initial hydrocarbon, and it is by successive additions of instalments of CH_2 that groups of similar hydrocarbons and their derivatives may be obtained. Thus CH_4, C_2H_6, C_3H_8, C_4H_{10}, etc., are some of the members of the group or series of hydrocarbons to be got by starting with methane, and by adding successive increments of CH_2. Such a group is called a **homologous series,** which may be defined as *a series of compounds the successive members of which increase in complexity by CH_2.* It will be evident that what applies to the hydrocarbons will apply also to their derivatives; so that we have not only homologous series of hydrocarbons, but also homologous series of the oxygen, etc., derivatives of hydrocarbons running parallel to the hydrocarbon series themselves. Thus we have—

Methane (CH_4)	Methyl alcohol	(CH_4O),
Ethane (C_2H_6)	Ethyl ,,	(C_2H_6O),
Propane (C_3H_8)	Propyl ,,	(C_3H_8O),
Butane (C_4H_{10})	Butyl ,,	($C_4H_{10}O$),
Pentane (C_5H_{12})	Pentyl ,,	($C_5H_{12}O$),
Hexane (C_6H_{14})	Hexyl ,,	($C_6H_{14}O$),

and so on through many hydrocarbons and their derivatives.

How many Series?—There are about ten of these homologous series of hydrocarbons and their compounds known, but we now consider only three—namely, those formed by the successive addition of increments of CH_2 to the three hydrocarbons—methane, ethylene, and acetylene—with which we are acquainted. As the series are built up in a geometrical progression, it is convenient to express the whole of the members of each series by a formula.

Methane Series.	Ethylene Series.	Acetylene Series.
$(CH_4) = C_nH_{2n} + 2$	$(C_2H_4) = C_nH_{2n}$	$(C_2H_2) = C_nH_{2n} - 2$.

Hence, starting with, say, five carbon atoms, the corresponding members of the three homologous series would be as follows:—C_5H_{12}, C_5H_{10}, C_5H_8.

The Methane Series.—Of the bodies to be studied for the Advanced Theoretical Examination, all, with the exception of ethylene and acetylene, belong to the methane series; hence we shall now confine our attention exclusively to this, merely stating, with respect to the other series, that by analogous methods they may be converted into analogous compounds. For example, methane may be oxidised by successive steps into (1) an alcohol, (2) an aldehyde, (3) an acid; and the same is true of ethylene and acetylene, and the parallel holds good with respect to the action of reagents other than oxygen. Hence in organic chemistry there are *general* methods of procedure to be employed throughout the whole of the series, and in each individual case the result, if not the same, is similar. It is this general similarity that makes the detailed study of organic chemistry possible.

Properties of the Methane or C_nH_{n+2} Series of Hydrocarbons.—(*a*) *Physical.* The first four members are *colourless gases,* liquefying as follows:—CH_4 at − 11°, under a pressure of 180 atmospheres; C_2H_6 at 4°, under 46 atmospheres; butane at 0°, under 1 atmosphere. The members containing from 4 to 16 atoms of carbon are colourless liquids, with boiling points that rise as the series is ascended, the difference in boiling point between consecutive members of the series being about 30°. From about $C_{16}H_{34}$ the methane hydrocarbons are colourless solids, with melting points that increase with increasing molecular weight.—(*b*) *Chemical.* All members of the series are stable, and have little affinity for even such powerful reagents as nitric acid, fuming sulphuric acid, alkalis, chromic acid, or potassium permanganate. From this circumstance the name paraffin has been given to the series (from *parum,* little; and *affinis,* affinitive), which is more commonly called the **paraffin series** than the methane series of hydrocarbons. The student has only to try the effect of the above-mentioned reagents upon paraffin wax, which consists of the higher members of the paraffin series, to realise how well this name fits the series. He will also understand why paraffin wax is so extensively used in the laboratory. Contrariwise, chlorine, and, less readily, bromine, act upon the paraffins in sunlight; in such wise, however, as to substitute chlorine or bromine for hydrogen, it being impossible to add the halogen to the hydrocarbon without first making way for it, as it were, by eliminating the hydrogen. Thus $CH_4 + Cl_2 = CH_3Cl + HCl$. This fact is in sharp contrast with what obtains in acting upon the hydrocarbons of the ethylene or acetylene series, for these bodies readily form additional compounds with the halogen. Thus $C_2H_4 + Cl_2 = C_2H_4Cl_2$, from which we infer this very important difference between the paraffins and the olefines (as the members of the ethylene or olefiant series are called)—namely, that the former are saturated, whilst the latter are unsaturated hydrocarbons.

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Work performed in driving Dynamo.—As proved in last month's article on "Electricity and Magnetism," there will be no current generated in the armature of a dynamo unless the brushes are connected by means of external conductors forming a closed circuit. When the brushes are so connected, the current in the circuit will be numerically equal to the E.M.F. generated by the dynamo, divided by the total resistance of the circuit. This resistance is equal to that of the external circuit, added to the internal resistance between the dynamo brushes. The internal resistance between the dynamo brushes is equal to half the resistance of either of the parallel circuits constituted by the closed armature winding.

Let us suppose that the external resistance is such that a current of C ampères is produced. This current is equal to $\frac{C}{10}$ units in the C.G.S. system. In each of the parallel branches of the armature circuit the current will be equal to half of this value—that is, to $\frac{C}{20}$ units in the C.G.S. system. This will be the current flowing through each conductor.

As proved in a previous article, the force, in dynes, acting on a conductor of length L, placed at right angles to a magnetic field of strength B, is equal to {LB × current flowing in conductor}. Thus, if L is the length of the armature (from front to back), the force, in dynes, acting on a conductor under one of the poles will be equal to $\frac{LBC}{20}$.

This force acts in such a direction that it opposes the rotation of the armature.

In one second this force is overcome through a distance equal to $\frac{n}{60}$ times the circumference of the armature, where n represents the number of revolutions per minute. If D is the diameter, in centimetres, of the armature, the circumference of the armature is equal to πD centimetres, and each conductor moves through a distance of $\frac{n}{60}\pi D$ centimetres per second. Let there be N active wires under either pole. Then since each of these wires experiences a force equal to $\frac{LBC}{20}$ dynes, and there are 2N active wires comprised in the armature circuit, the total work done per second in driving the armature is equal to

$$2N \times \frac{LBC}{20} \times \frac{n\pi D}{60} = N \cdot \frac{n\pi D}{60} LB \cdot \frac{C}{10} \text{ ergs.}$$

Now $\frac{n\pi D}{60}$ is equal to the velocity V of each conductor, in centimetres per second. As previously proved, the E.M.F., in C.G.S. units, generated by each active wire, is equal to $VLB = \frac{n\pi D}{60} LB$. Thus $N \cdot \frac{n\pi D}{60} LB$ is equal to the E.M.F. of the dynamo in C.G.S. units. If the E.M.F. of the dynamo is equal to E volts, then

$$N \cdot \frac{n\pi D}{60} LB = E \times 10^8,$$

and the work done per second in driving the dynamo is equal to $E \times 10^8 \times C \times 10^{-1} = EC \times 10^7$ ergs per second.

Power.—*A rate of performance of work equal to 10^7 ergs per second is termed a* **watt.** Thus the work performed per second in driving a dynamo has the value EC watts as a lower limit. Friction in the bearings, and other similar losses of energy, will increase the rate at which work is performed. The rate of performance of work is termed the **power.**

Connection between Horse-power (H.-P.) and Watts.—The following data must be used as the basis of a comparison between horse-power and watts:—

1 lb. = 454 grams.

1 inch = 2·54 cms. ∴ 1 ft. = 30·48 cms. = 30·5 cms. (nearly).

Gravity acts on 1 gram of matter with a force of 981 dynes.

One horse-power = 33,000 ft. lbs. per minute.

Now 33,000 ft.-lbs. per minute = 550 ft. lbs. per second.

Gravity acts on 1 lb. of matter with a force equal to 454 × 981 = 445,000 dynes.

When this force is overcome through 1 ft. distance, the work done is equal to

$$445{,}000 \times 30{\cdot}5 = 13{,}570{,}000 \text{ ergs.}$$

$$\therefore 1 \text{ ft. lb.} = 13{,}570{,}000 \text{ ergs.}$$

$$\therefore 550 \text{ ft. lbs. per second} = (550 \times 13{,}570{,}000) \text{ ergs per second} = 746 \times 10^7 \text{ ergs per second} = 746 \text{ watts.}$$

$$\therefore \mathbf{1\ H.\text{-}P. = 746\ watts.}$$

It should be noticed that the unit of power comprises a time element. Thus 1 H.P. is equivalent to 33,000 ft. lbs. *per minute*, whilst 1 watt is equivalent to 10^7 ergs *per second*.

Horse-power necessary to drive a Dynamo of given Output.—The product of the E.M.F. (in volts) into the current (in ampères) is termed the output of a dynamo. To convert watts into horse-power, we must divide by 746. Hence the horse-power necessary to drive a dynamo, when producing a current C ampères under an E.M.F. of E volts, is equal to

$$\frac{EC}{746}.$$

It thus becomes evident that the horse-power required will vary with the current produced; and the current, as we have seen, depends on the resistance in the external circuit. On light load (an expression used to signify that the resistance in the external circuit is practically infinite, or that no current is being produced) the horse-power required to drive the dynamo will be that necessary merely to overcome the frictional resistance of the bearings, etc. The E.M.F. of the dynamo will fall slightly as the current increases, but the product of the current into the E.M.F. increases. No work is performed in the electrical circuit unless a current is produced.

Transfer of Energy.—We thus see that a dynamo is a machine in which mechanical energy is converted into electrical energy. A dynamo does not produce energy. The law of the conservation of energy states that the energy of the universe is constant, and can neither be added to nor diminished. All that it is possible for us to do is to transform energy from one form to another, and to transport it from place to place.

In order to obtain electrical energy from a dynamo, we need a steam or gas engine, a water turbine, or some other prime mover. In the furnace of the steam-engine, the solar energy which reached the earth millions of years ago, and was stored up in the plants from which coal was produced, is converted into heat by combustion. This is an example of the conversion of chemical energy into heat. In the boiler this heat is utilised to evaporate water; the energy here once more assumes the potential form. In the cylinder of the engine the energy of the steam is used up in communicating motion to the piston and connecting rod, and ultimately in setting the armature of the dynamo in rotation. In the dynamo the energy assumes the form of the energy of the electric current. If the energy of the current is utilised for house-lighting purposes, the thin carbon filaments of the electric glow lamps are heated, and thus rendered incandescent. Once more the energy takes the form of heat. Part of the energy is used in setting up the ethereal vibrations which constitute light, whilst the rest is dissipated in the form of heat communicated to the air and other substances surrounding the lamp.

It is easily seen that we are primarily dependent for our supply of transformable energy on the radiations reaching the earth from the sun. In the case of coal the nature of this dependence has already been sketched out. In order to drive a turbine or water-wheel, it is necessary for us to have water flowing from a higher to a lower level. In order that we should have a constant supply of water flowing in this manner, the water must be evaporated from the seas and lakes, formed into clouds at the higher levels of the atmosphere, drifted over the hills or mountains, and there condensed and returned to the earth as rain. These transformations are effected by the agency of solar radiations received on the earth. Consequently all machines merely utilise the energy which has reached the earth from the sun, either recently or ages ago.

Lord Kelvin estimates that the rate at which energy is radiated from the sun amounts to about 7,000 H.-P. per square foot of the sun's surface.

J. Y. Buchanan, from recent measurements made under the cloudless sky of Egypt, estimates that the rate at which energy arrives at the earth is equal to about 1 H.-P. per square metre of the earth's surface. Thus, for the whole of the earth, energy is arriving at the rate of 130 billion (130×10^{12}) H.-P. Assuming that the population of the earth is 1,500 millions, the energy per human being amounts to

$$\frac{130 \times 10^{12}}{15 \times 10^8} = 200{,}000 \text{ H.-P.}$$

Professor Griffiths has recently suggested a method by which some idea of the magnitude of a billion can be obtained. Assume that the area of London is 10 × 10 = 100 square miles; then one billion ordinary bricks would cover this area to a depth of 25 feet. Thus even the number of bricks contained in the houses built in London falls far short of a billion.

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THE space available in these "Notes" will not allow more than to draw attention to important formulæ; the various proofs may, when necessary, be obtained from books on the subject. It is, however, of the utmost importance to carefully notice the connection between the various formulæ. If this is done, and a few of the more important are committed to memory, any other that may be required may usually be readily deduced. Thus having obtained, as already indicated, the two equations, $v = V \pm at$ (1) and $s = Vt \pm \frac{1}{2}at^2$ (2), it is an easy matter, by eliminating t from (1) and (2), to obtain $v^2 = V^2 \pm 2as$ (3).

In a similar manner the formulæ applicable to "motion on an inclined plane" may be obtained. Thus a particle of mass m in motion on a plane inclined at an angle θ to the horizon has components $mg \sin\theta$ and $mg \cos\theta$ along and perpendicular to the plane respectively; and as the former is the force causing motion, we have the relation—

$$mg \sin\theta = ma.$$
$$\therefore a = g \sin\theta.$$

Hence the formulæ for a smooth inclined plane may be obtained from (1), (2), and (3) by replacing a by $g \sin\theta$.

The Atwood's machine is sometimes described as "a machine for diluting g." This description may also be applied to the inclined plane, in which the acceleration may have any value from o to g by suitably altering the inclination θ.

Rough Inclined Plane.—It is no doubt already obvious that all surfaces with which we are acquainted are more or less rough, and as frictional forces always tend to oppose motion, it follows that when a body is in motion *up* an inclined plane, the force of friction acts down the plane; and if the body is moving *down* the plane, the force of friction acts in the opposite direction. If a plane be inclined at an angle θ to the horizontal, and a body of mass m or weight W rest on the plane, then if F denotes the force of friction, and N the normal pressure between the surfaces in contact, we have the relation—

$$\frac{F}{N} = \tan\theta.$$

The greatest value of $\frac{F}{N}$ is μ, where μ denotes the coefficient of friction, or $F = \mu N$ when slipping is just about to occur. When F is less than μN, the body remains at rest, and motion takes place when F is greater than μN.

Hence, when a weight W rests on a plane inclined at an angle θ to the horizon, and μ is the coefficient of friction, the force necessary to move the body up the plane must be equal to W $\sin\theta$, together with the frictional force μN. If P denotes the force, then we have

$$P = W \sin\theta + \mu N.$$
$$\text{Also } N = W \cos\theta.$$
$$\therefore P = W(\sin\theta + \mu \cos\theta).$$

Again, the force P, which will just be sufficient to prevent the body sliding down the plane, is given by

$$P = W(\sin\theta - \mu \cos\theta).$$

Ex. 1. A particle will just stay at rest on a plane inclined at an angle of 30° to the horizon; if the angle of the plane is reduced to 15°, compare the force acting parallel to the plane that will just make the particle slide down the plane, with the force acting parallel to the plane that will just make the particle slide up the plane.

Let P denote the force acting up the plane, and ϕ the force acting down the plane.

$$\text{Then } P = W(\sin\theta + \mu \cos\theta),$$
$$\text{and } \phi = W(\sin\theta - \mu \cos\theta).$$
$$\mu = \tan 30° = \frac{1}{\sqrt{3}}, \quad \theta = 15°.$$
$$\therefore P = W\left(\frac{\sqrt{3}-1}{2\sqrt{2}} + \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}+1}{2\sqrt{2}}\right)$$
$$= \frac{2W}{\sqrt{6}}.$$
$$\phi = W\left(\frac{\sqrt{3}-1}{2\sqrt{2}} - \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}+1}{2\sqrt{2}}\right) = \frac{W(1-\sqrt{3})}{\sqrt{6}}.$$
$$\text{Hence } \frac{\phi}{P} = \frac{1-\sqrt{3}}{2}.$$

Motion on a Rough Inclined Plane.—When the inclination of a plane is greater than the angle of friction for the surfaces in contact, a body placed on the plane will move with increasing speed down the plane. To find its acceleration, we may proceed as follows:—

Let θ be the inclination of the plane, m the mass of the body, and N the normal pressure between the body and the plane.

Resultant force acting down the plane is $mg \sin\theta - \mu N$.

Also $N = mg \cos\theta$.

Using the relation $F = ma$, we have—

$$mg \sin\theta - \mu\, mg \cos\theta = ma.$$
$$\therefore a = (\sin\theta - \mu \cos\theta)g \quad (4).$$

Ex. 2. A particle slides down a rough inclined plane. (*a*) Find the acceleration of its velocity. Under what circumstances would its velocity be retarded?

(*b*) The angle of friction between a particle and a plane is 30°, and the angle of inclination is 15°. If the particle begins to slide down with a velocity of 100 feet a second, how far will it slide before coming to rest? (1896.)

(*a*) The acceleration may be obtained by substitution in Eq. (4). It is obvious that positive acceleration will occur when $\sin\theta$ is greater than $\mu \cos\theta$, and negative acceleration or retardation when $\mu \cos\theta > \sin\theta$.

(*b*) $$\mu = \tan 30° = \frac{1}{\sqrt{3}}.$$

From (4) $$a = (\sin 15° - \frac{1}{\sqrt{3}} \cos 15°)g$$
$$= \left(\frac{\sqrt{3}-1}{2\sqrt{2}} - \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}+1}{2\sqrt{2}}\right)g.$$
$$\therefore a = \frac{(1-\sqrt{3})}{\sqrt{6}}g.$$

Let s denote the distance moved through before the particle comes to rest. Then, from the relation,

$$v^2 = V^2 - 2as.$$

When the particle comes to rest, $v = 0$, and we obtain—

$$0 = V^2 - 2as,$$
$$\text{or } s = \frac{V^2}{2a} = \frac{2500(3\sqrt{2}+\sqrt{6})}{g} \text{ ft.}$$
$$= 519{\cdot}4 \text{ ft.} \qquad (g = 32{\cdot}2).$$

It should be noticed that for a smooth plane $\mu = 0$, and (4) becomes

$$a = g \sin\theta.$$

Ex. 3. The slope of a plane is 45°. Find the time in which a body would slide from rest down to 100 ft. of its length (*a*) if the plane were smooth, (*b*) if it were rough, and the angle of friction were 15°. Ans. (*a*) 2·97 sec.; (*b*) 3·47 sec.

Ex. 4. The angle of friction between a body and the plane is 30°. What differences, as to the friction called into play, are there between the cases when the plane is (*a*) set at an angle of 15° to the horizon, (*b*) at an angle of 30°, (*c*) at an angle of 45°? (1892.)

Ex. 5. The angle of inclination of a plane is 30°, the coefficient of friction 0·5. If one body falls freely through a given distance, and another body slides down the plane along an equal distance, show that the time of the first body's motion will very nearly equal one-fourth part of the time of the second body's motion. (1894.)

Ex. 6. A particle of given weight is placed on an inclined plane, and stays at rest. What is the magnitude of the friction called into play? Under what circumstances would the particle stay at rest if the inclination of the plane were increased? (1896.)

Ans. When $\theta < \tan^{-1}\mu$.

Ex. 7. The coefficient of friction on an inclined plane is less than the ratio of the difference between the length and height of the plane to the base. Show that more force is required to lift a body to a given height than to drag it up the inclined plane to the same height by a rope parallel to the plane. Compare the amounts of work done in the two cases. (1901.)

Ex. 8. A particle rests on a rough inclined plane, and is acted on by a force which is just on the point of making it slide up the plane. Find the relation between the force and the weight.

A particle whose weight is 10 lbs. is placed on a rough plane inclined at an angle of 30° to the horizon; it is acted on by a force up the plane equal to the weight of 6 lbs., acting along the plane; the particle does not move. Find the friction between the particle and the plane.

If the particle is just on the point of sliding, find the coefficient of friction. (1898.)

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The prize is awarded to "Tito," the pseudonym of R. Clark, L.C.P., F.E.I.S., National School, Seaham Harbour.

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Second Class.—Heather and snow, Portia (Ramsgate), Jimmy, Waterlily, Dimanche, Excelsior, G.E.M., Portia (Bridge of Allan), Nenuphar, Clorinda, Bellona, Heather, Coronation, Fanny, Irénée, Winnie, Grenoville et Cie, Plodder, Lily of the Valley, Veronica (Southampton), Indian John, Dougal, Malheureuse, Torpedo, Ruins, Cathel, H.W., Psyche, Pyro, ——, Turquoise, Chryseis, Morganwg.

Disqualified.—Rule 2: La première fois, Gitano.

Received too late for classification: Miss.

Report.

There is a general improvement in the papers, due to a large extent, I believe, to the excellent practice in translation which we afford our readers every month. The translations in general are easier in style, less jerky, and more coherent. Some competitors confounded "passion" with "temper." Avarice, for example, is a passion, but an avaricious man possesses the cool temperament which would fortify him against fits of temper. Two or three students, heedless of what follows, construed *ceux de la table* as "table games on gaming." Prominent among several curious translations was the following: "I may add that one of my predominating tastes consists in buying things which cannot be purchased."

French Prize Translation.

I have very strong passions, and whilst I am under their influence nothing equals my impetuosity. I no longer know caution, or respect, or fear, or decorum. I am cynical, impudent, violent, and fearless. There is neither shame that restrains nor danger that affrights me. But for the one thing that fills my mind, the universe is nothing to me. All this, however, lasts but a moment; the next throws me into utter prostration. Take me when I am calm, and I am indolence, nay timidity, personified. Everything alarms me; everything discourages me. A fly on the wing makes me afraid. A word to be said, a movement to be made, is a terror to my sluggishness. Fear and shame overpower me to such a degree that I would fain disappear from mortal eyes. If I have to act, I don't know what to do; if I have to speak, I don't know what to say; if I am looked at, I am abashed. I can sometimes, when my feelings are roused, find what I have to say; but in ordinary conversation I find nothing—absolutely nothing. Hence for that single reason—that I have to talk—I find conversation unbearable. Add to all this that none of my strongest predilections is for things that are bought. I must have my pleasures pure, and money poisons all pure pleasure. For instance, I am fond of the pleasures of the table; but as I can endure neither the restraint of polite society nor the debauchery of the dram-shop, it is only in the company of a friend I can enjoy them, for by myself I cannot. My imagination then busies itself with something else, and eating is no pleasure to me. TITO.

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THE EDITOR'S TABLE

GEORGE BELL AND SONS.

Bell's Latin Course: Part II. By E. C. Marchant, M.A., and J. G. Spencer, B.A. Part I., reviewed in this journal some time ago, dealt with the first two declensions, the active indicative of the first conjugation, and little more. Part II. wisely begins with half a dozen pages devoted to recapitulation of the previous book, so that pupils will not need to use both at the same time.

The most surprising thing in turning over the leaves of this little book is to find it copiously illustrated. The full-page coloured pictures are particularly good. Nor is any picture wasted. Each illustration gives the subject of one or more exercises; and these, though consisting of short sentences in the usual style, are continuous stories. These two features add greatly to its interest, and therefore to its value to a teacher, for this course is clearly intended for schools in which the study of Latin is commenced at an early age.

The exercises serve a very useful secondary purpose: their subjects are such as to give, little by little, a knowledge of the ancients, their religion, dress, arms, and customs, and of the best known personages of history or of fable. Thus, among these useful exercises there is one on Homer, another on Hercules, on the Druids, Mercury, Juno, Cicero, the Capitol. This is a change in the right direction.

In this book, the second part of the course—the declensions of nouns and the conjugations of the indicative mood of active verbs—is completed. In the statement of grammatical rules greater accuracy is observed than is usually to be met with in elementary books.

Bell's Latin Course: Part III. By Marchant and Spencer. This book completes the series, the other two having been issued some months past. Every page has its illustration, some being really beautiful; and every exercise is a complete story. The rules are put very simply, and in every case the rule is shown by example before being stated in words. The three parts are intended for a first year's course only, and cover the declensions and the regular verbs; but to cover the whole in one year, at least twenty-five per cent. of the total school time would need to be spent on this subject, an allowance more liberal than modern ideas on education would assign to it. Apart from this consideration, the book is the best we have reviewed for a long time.

BLACKIE AND SON.

French Conversational Sentences. By G. E. Avery. A very useful book for class or private use, taking in a large number of irregular verbs and idioms. It contains many useful sentences applicable for letter-writing and general composition. The chapters are well arranged, and are in grammatical order; that on the use of the verb "faire" is most comprehensive and valuable.

Little French Classics: Mateo Falcone, etc. (Merimée); **Gargantua et Pantagruel** (Rabelais). The former of these two publications will be found to be very useful for French reading and study, but we question very much whether the second will serve any other purpose (except to advanced students) than to provide a comparison between the French of the sixteenth century and the twentieth. Each book contains a note as to the authors, and there are some scholarly notes to help the student with the text.

A Brief Sketch of French History, 1789–1815, by Léony Guilgault; and **1815–1873,** by Henry Hirsch. Two very concise and reliable little books, suitable for those reading for the Army and higher Civil Service examinations, and other students of elementary French history.

Modern Language Series: La Jeune Sibérienne. Edited by W. G. Etheridge, M.A. This interesting story is well produced in this series. The book contains notes on the author, the text, and on awkward and intricate idioms, and a vocabulary. The notes are clear and scholarly, evidently the work of a practised teacher; and the vocabulary, which is compiled by Miss E. M. Booth, is complete and helpful.

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Le Verre d'Eau. By Scribe. This play is well known to teachers of French in England. It was set for the Teachers' Certificate Examination two years ago, and it often appears in the syllabus of public examinations. The language is a model of the conversational style, and the reader's interest is well sustained by the plot, although the author has taken a few liberties in the matter of historical accuracy. The notes are short, but to the point.

Trois Comédies. By Alfred de Musset. This little volume includes *Fantasio*, *On ne badine pas avec l'amour*, and *Il faut qu'une porte soit ouverte ou fermée*. The first of these has for subject a marriage arranged for a political end, but the most interesting point is the character study of the title role, in which students of Alfred de Musset will see the poet's own restless character depicted. The second piece was written in the following year (1834), and in it we see undoubted traces of the influence of George Sand upon the poet, who wrote with more passion than consistency. When charged by his friend, Alfred Tattet, with having introduced details which seemed to belong to different periods, he replied: "Pouvez-vous me dire de quel temps est l'homme, et sous quel règne a vécu la femme?" The third play is a remarkable instance of the ability of a poet to convert a mere interesting and animated conversation of real life into a delightful little comedy.

The edition is well got up, and the introduction will give the young student a capital idea of the life and works of this remarkable poet.

Cinq Scènes de la Comédie Humaine. By Balzac. This is almost the first time that the works of this great novelist have been brought under the eye of English-speaking school children. The works of Balzac embody matters of social philosophy and human life, which give them an intense interest for the adult reader, but render them less suitable than most books for the use of children. The five episodes which make up this book have been well chosen, for they are admirably suited for class purposes, and should dispose the pupil to take up Balzac's works later on, when they can be read with greater advantage.

Exercises in French Syntax and Composition. By Alfred Hennequin, Ph.D. This book aims at giving a thorough drilling in syntax, by setting out the rules in a clear and concise form, and supplying copious exercises. In general this is very well carried out, but it is certainly a serious mistake to say (p. 21): "They [that is, demonstrative pronouns] frequently express the possessive case of the nouns for which they stand, and thus correspond to the *'s* in English. Example: 'J'ai entendu votre voix et *celle* de votre sœur.'" In the first place, the noun for which "celle" stands is *voix*, and "celle" does *not* express the possessive case of *voix*, as this noun would be the direct object; and again, the *'s* in English is an inflection, and although we might in a sense say that the preposition "de" corresponds to it, certainly the pronoun does not. This point, we trust, will be set right in future editions. The second part of the book consists of passages of continuous prose for translation. These are arranged in three sections—easy, more advanced, and idiomatic. A full vocabulary makes the book complete in itself.

French Modal Auxiliaries. This little book treats of the various uses of the five verbs *devoir*, *falloir*, *pouvoir*, *savoir*, and *vouloir* in a very thorough and systematic manner, and of its great practical value there can be no doubt. We cannot help thinking, however, that the name is ill-chosen, and that it is illogical to call these verbs auxiliaries at all. If the mere fact of governing another verb is the mark of an auxiliary, then the auxiliaries are legion. It is much better to limit the term to those verbs which have no meaning of their own, but simply assist in the *conjugation* of other verbs. If we compare two such sentences as "Vous me *devriez* une éternelle reconnaisance si je le faisais," and "Vous *devriez* être reconnaisant si je le faisais," we must come to the conclusion that *devriez* is a principal verb in both cases. The teacher and student, however, who are not so particular about grammatical theory, will find the book of great practical use. The explanations of each use of the several verbs are followed by illustrative examples, reading and composition exercises, and conversations.

The French Subjunctive. By C. C. Clarke. The correct use of the subjunctive is one of the most difficult things to ac-

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quire in the art of French composition; so much so, that French people themselves invariably avoid the use of the imperfect subjunctive in speaking, lest they should be thought affected. This little book deals with the matter in a systematic manner, and supplies well-devised exercises on each point as it is discussed. On matters that are open to dispute, as for instance the tense required after the perfect indicative, the writer sets out the opinions of French grammarians on both sides.

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Problems and Exercises in English History. By J. S. Linsey. This is quite a new departure in books for the study of history. It shows the young student how to set about his work, where to find his facts, and how to set them out when he has found them. The latter object is attained by taking a number of questions from public examinations and giving model answers to them. This at first sight looks like "cram," and an attempt to provide the pupils with a ready-made answer, should they happen to come across the same question in a future examination. But such an opinion would be wide of the truth. The use of the book should get the pupil into habits of industry in finding his facts, and lead to a broad and intellectual study of the subject. Indeed, our only fear is that our overcrowded curriculum is the only hindrance to putting the book into the hands of every pupil. It certainly ought to be in the hands of every teacher of history.

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The Teaching of Mathematics. Edited by John Perry. Pp. vi + 108. This little volume is one which should be in the hands of every teacher of mathematics without exception. It commences with the remarkable paper read by Professor Perry before last year's meeting of the British Association. This is followed by a verbatim account of the ensuing discussion, and by the views of various representative teachers not present at Glasgow when the subject was considered. It is not possible in the brief limits of a review even to outline the revolutionary syllabus which Professor Perry has sketched, and any criticism of it would require an article to itself. Suffice it to say that the professor believes that all modern teachers of mathematics are hopelessly wrong in method, and miserably infertile in result; and, further, that a very large number of educational authorities are found to agree with him. The professor has the courage of his opinions, and, indeed, seems commonly to have most courage when he finds himself *Perrius contra mundum*, with nobody to agree with him. Whatever he says is said brilliantly, and, whatever its ultimate result, the book cannot fail to be inspiring to teachers.

Those who wish to pry deeper into these mysteries should procure from Messrs. Eyre and Spottiswoode Professor Perry's *Lectures on Practical Mathematics*, wherein he has made a confessedly partial and incomplete attempt to work out his syllabus in detail, or Mr. Castle's *Elementary Practical Mathematics* (Macmillan), which was recently reviewed in these columns, where the same attempt is made with greater detail. They should read also an important letter on "The Teaching of Mathematics in Public Schools," which appeared in *Nature* of January 16, over the signatures of the mathematical masters at our most important public schools.

It may be added that, as the result of Professor Perry's paper, a most influential committee of the British Association was appointed. When this committee has reported, it will perhaps be possible to refer to this matter in our columns again.

THOMAS MURBY.

Analyses of English History. By W. C. Pearce and Dr. S. Hague. A book that has reached the ninety-seventh edition needs no recommendation. The edition before us has been revised and enlarged, and the events of the present year included.

THOMAS NELSON AND SONS.

Class Lessons in Domestic Economy. By Miss Ethel Lush. Readers of THE PRACTICAL TEACHER will expect much from Miss Lush in her special department, for such indeed may domestic economy be truly described. It is pleasing to be able to say at the outset that they will not be disappointed with the "Class Lessons," which are thorough in respect to matter and excellent in presentation. Wherever possible, practical work is given, and the authoress insists upon the necessity for the working of the experiments that she has scattered throughout the two hundred odd pages of her manual. These experiments are suitably chosen, both from the point of view of their propriety in exposition, and from the more important aspect of the possibility of their performance, with simple, inexpensive apparatus, by teachers who have had no special training in practical science. We agree with Miss Lush that "the eager attention and keen interest awakened in children by even the simplest experiments is abundant return for the trouble involved." We therefore join with the authoress in hoping that "teachers will not be tempted to omit such a valuable part of the course." As to the course itself, it is divided into five sections, primarily designed to meet the requirements of Standards III. to VII., but capable also of affording much enlightenment to candidates for the Scholarship and Certificate Examinations of the Board of Education.

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The illustrations, again, are as numerous—in all there are upwards of a hundred of them—as they are excellent.

Each chapter concludes with a summary, which should be useful to the scholar as a brief *résumé* of the whole lesson, and to the teacher as providing a very suggestive foundation for recapitulatory questions.

The index is unusually full, and is furthermore divided into sections, each complete for its own particular standard.

It will be evident, then, that nothing is wanting to make the book eminently useful to practical teachers of domestic economy and to their pupils. To these, therefore, we confidently commend Miss Lush's "Lessons," as worthy of their most careful consideration; and we shall be greatly surprised if the book does not meet with the wide circulation that its excellence, in our opinion, undoubtedly deserves.

Madamscourt; or, The Adventures of a Fugitive Princess. By H. May Poynter. A combination of true and imaginary history makes an exciting story of the momentous times after the death of Queen Anne, and the scenes are laid both in England and on the Continent.

The main story is about the escape of the Princess Clementina Sobieskà from Innsprück in 1719, to be married to Prince James Francis Stuart; and there are plenty of thrilling adventures. Interesting descriptions are given of living in those times, and the method of conveying news by carrier pigeons; also of life at Oxford, the performance there of the cantata "Abigail," and a fight between the Whig and Tory students.

It is a splendid prize-book, and it will be read with interest both by children and adults.

PERCY RYDE.

Summary of the History of Europe, 1814-1848. This book will be very useful to students of this period. It does not claim to be a text-book, but by its summaries and tables it will enable the student to focus attention on one part of the work at a time. It gives an outline of the condition of each European state in 1814, a list of the sovereigns of Europe during the period, a summary of events in each year, and a short biography of each important person. The only suggestion we can make to increase its usefulness is the addition of a short bibliography to indicate the books in which the student can find more lengthy accounts of the different events. We trust that the first edition will soon be sold out, and that a list of authorities may be inserted in the

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*** Teachers who are about to prepare their new Drawing Schemes on the lines of the "New Primary Drawing Circular" should send for the Illustrated Prospectus of **NELSON'S NEW DRAWING COURSE**, post free, on application.

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"Primary Drawing."

THE Circular issued by the Board of Education on "Primary Drawing," and the accompanying illustrations and notes, have been received with that interest and attention which official documents of a legislative tendency always command. In brief, the purpose of the Circular is to widen the scope of Drawing, and to secure more intellectual training from its practice.

As to medium, the Board of Education deprecate the practice of confining the pupil to pencil drawing. The brush and the chalk have special excellences of their own, and open the way to freer manipulation and more artistic results. Slates and blackboards, as well as paper, should be made use of. "Blackboard Drawing" is the term used in the Circular for what is more commonly known as Free-Arm Drawing.

As to the training which should result from "Primary Drawing," some paragraphs of good advice are given. Beginning with the line, straight and curved; drawing from actual objects, carefully selected and simply rendered; drawing similarly from memory; the perception of proportion; the effect of perspective; ruler drawing, not confined to scale drawing and rigid forms, but used as a basis for colour and brush decoration,—such are some of the sound educational principles advocated.

Materials for the Lessons.

After the "inward digestion" of this Circular, and the study of the illustrations accompanying the same, comes the practical question of "devising graduated and progressive methods of instruction." What is needed to satisfy the requirements is not a course of Freehand, and one of Ruler Work, and one of Brush Drawing, and one of Blackboard Drawing, all more or less independent and taken up in alternating lessons. The only way of meeting the new demands is to devise a course of *Drawing* in which the same progressive principles are rendered now in one medium and now in another, always connected in aim, while each develops its own specific points of artistic effect. A combined course—not a series of parallel courses—that is what every school now requires.

Nelson's New Drawing Course.

Such a combined course, and one fulfilling in every detail the requirements of the new Circular, has been embodied in an eminently practical form in *Nelson's New Drawing Course*, of which the first three parts are now issued. The large coloured sheets provide abundant material for all the forms of exercise required by the classes, while special Blackboard Drawing may be provided for by the use of *Nelson's Free-Arm Drawing Cards*. The handbooks likewise contain a large number of full-page plates, containing representations of every form of drawing suggested in the illustrations issued by the Board of Education.

Correlation with Manual Training.

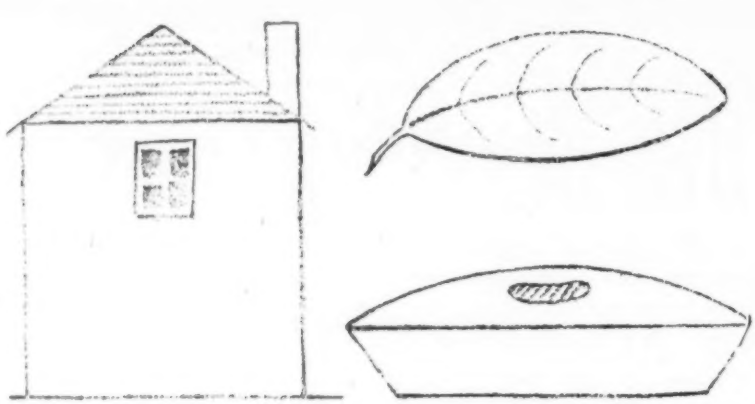
But the course provides something over and above what is laid down in the Departmental Circular. It shows exactly how the various branches of drawing are correlated one with another, and how each one should help the other in order to form a complete and harmonious whole. Hitherto the teacher has used a book produced by one author for outline drawing, a second book by another author for brush drawing, and perhaps even a third for simple design or modelling. In none of these would the work be on the same lines as in the others, nor would the schemes outlined in them have anything in common. The New Drawing Course obviates all this; every section is based upon the same educational principles, and all work towards the same end. The freehand lesson of to-day is connected with and helpful to the brush drawing lesson of to-morrow; the same natural form is expressed in outline, brush, or clay, and adapted to design in various mediums.

Gradation of Work.

Perhaps, however, the features that will appeal to the practical teacher most of all are the *grading*—which is exactly on the lines indicated in the Departmental Circular—and the systematic arrangement of each section of the work into definite periods. This enables the head teacher to indicate exactly how much work should be attempted within a given period. In the case of pupil teachers or junior assistants, such a plan is of inestimable value. There is no need to draw up a scheme with illustrations, the whole thing is ready to hand in every subject.

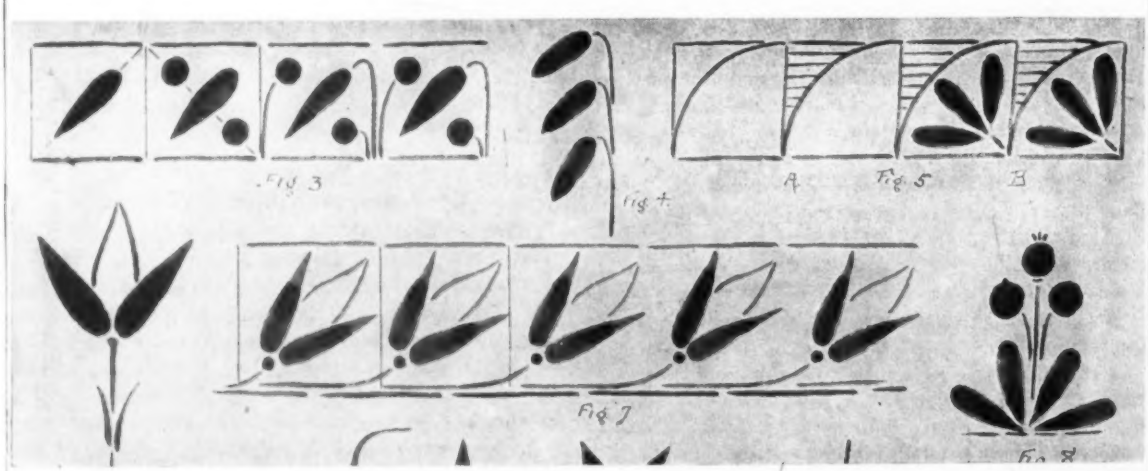
With such a wealth of illustrations, it is only possible to give a few selections to show the scope and variety of the course. An attempt has, however, been made in the few succeeding pages to give some idea of the completeness of the work.

SELECTIONS FROM THE COURSE AS ARRANGED FOR STAGE I.

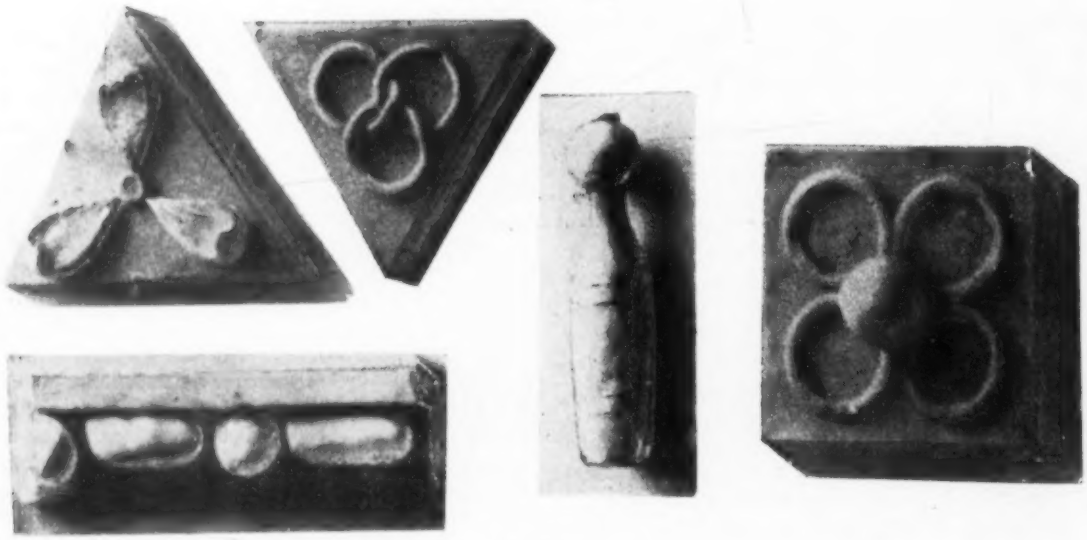


Free Drawing (freehand or free-arm) from Objects and Natural Forms.

Ruler, Freehand, and Colour.



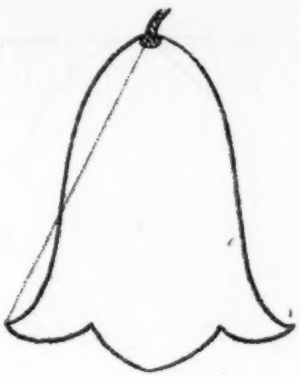
Brush Drawing.

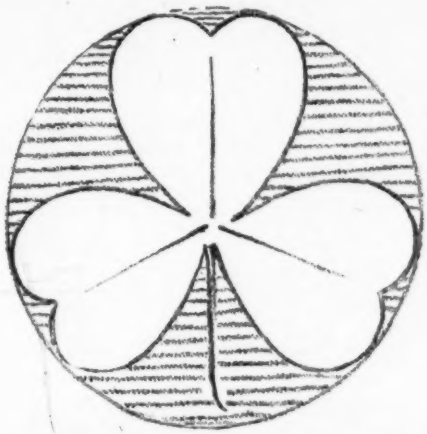


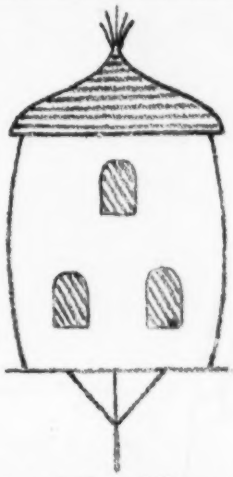
Modelling in Clay.

The Handbook to Stage I. contains nearly 250 illustrations similar to the above, and gives a complete course in every subject, with full directions and teaching notes.

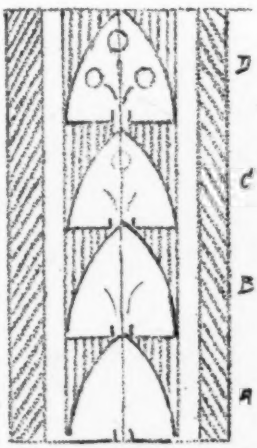
SELECTIONS FROM THE COURSE AS ARRANGED FOR STAGE II.



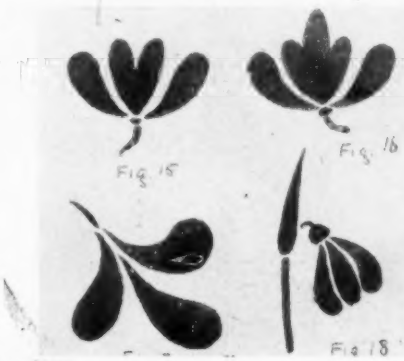


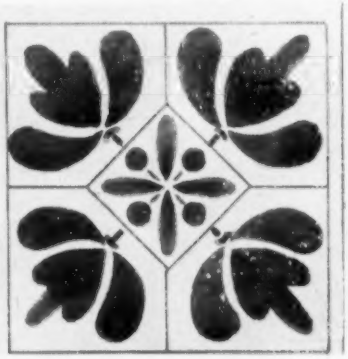


Free Drawing (freehand or free-arm) from Objects and Natural Forms

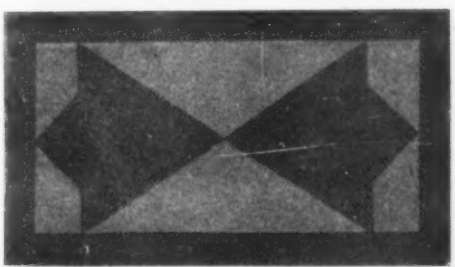


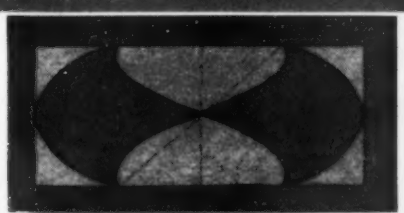
Line Design—Ruler, Freehand, and Colour.





Brush Drawing.



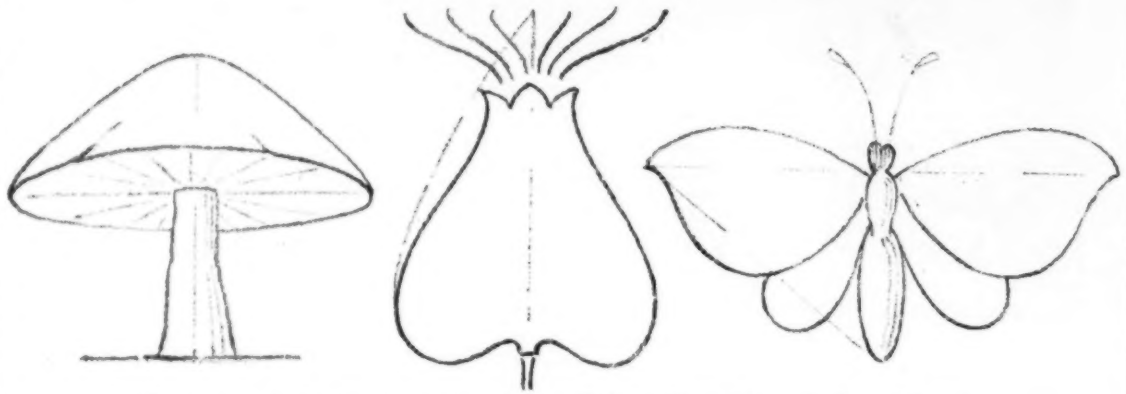


Elementary Pattern Work suitable for working out with coloured paper or tints of water colour.

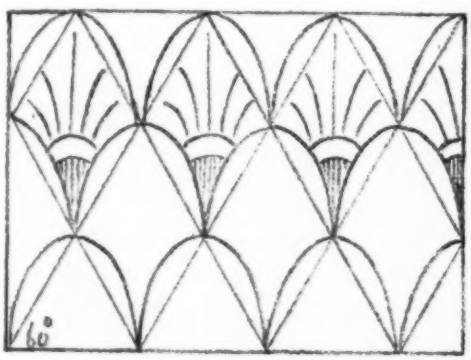
Modelling in Clay—Adaptation of natural forms to design.

Stage II. is illustrated by nearly 300 examples similar in character to the above. They are perfectly graded, and no other book will be necessary whatever branches of Drawing may be taught.

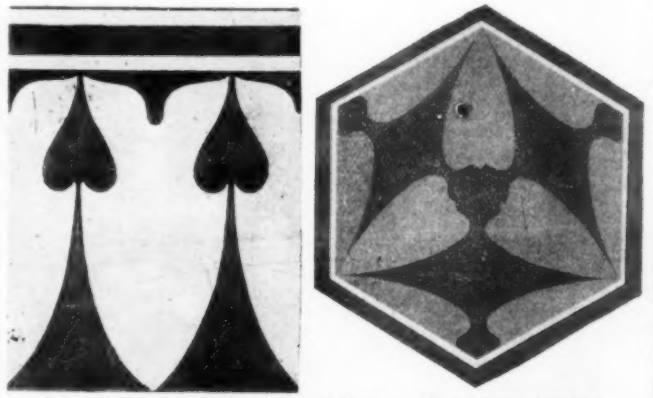
SELECTIONS FROM THE COURSE AS ARRANGED FOR STAGE III.



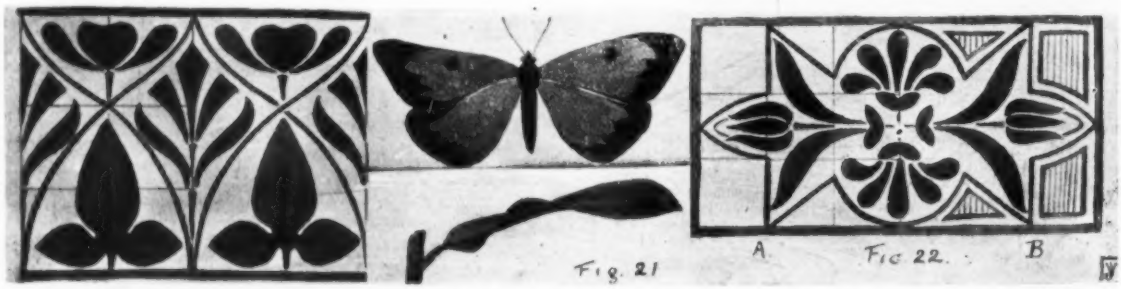
Free Drawing (freehand or free-arm) from Objects, Ornament, and Natural Forms.



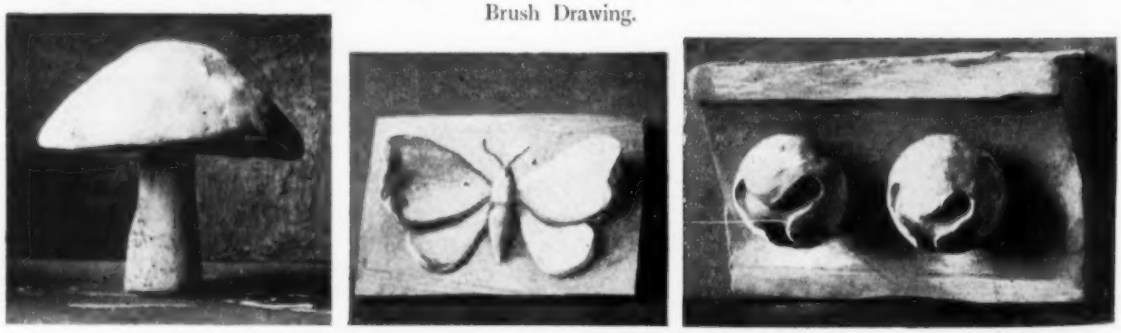
Line Design—Ruler, Freehand, and Colour.



Pattern Work suitable for working out with coloured paper or tints of water colour.



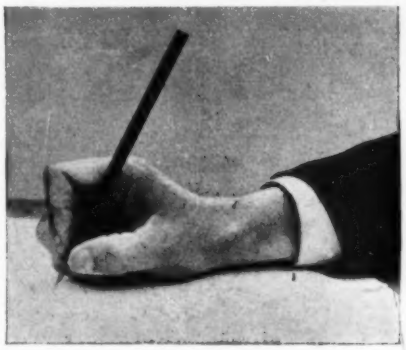
Brush Drawing.



Modelling in Clay—Natural Forms and Ornament.

These examples but inadequately represent the complete course in the various branches for Stage III. Special attention is directed to the working out of the same exercise in various mediums.

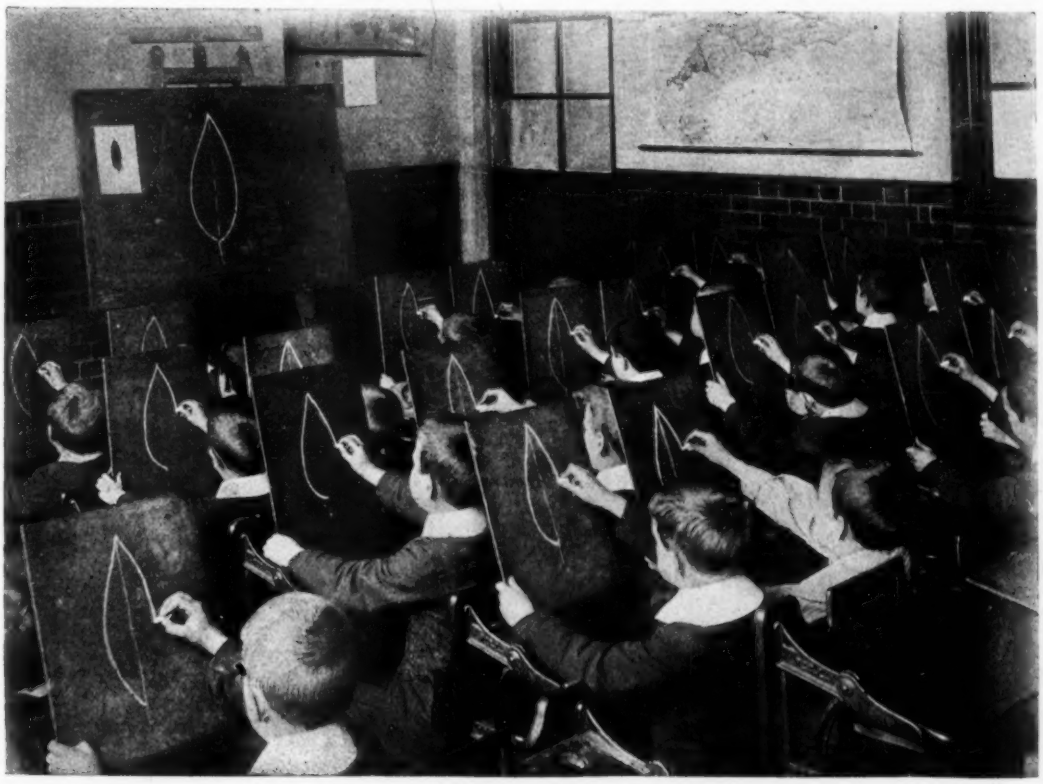
SPECIMEN ILLUSTRATIONS FROM THE HANDBOOK.



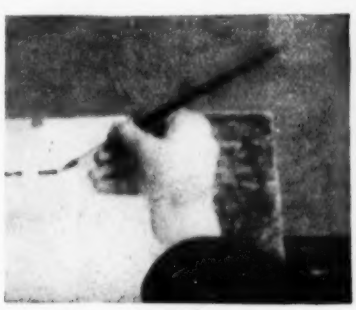
Wrong Position.

Right Position.

Holding the Pencil.



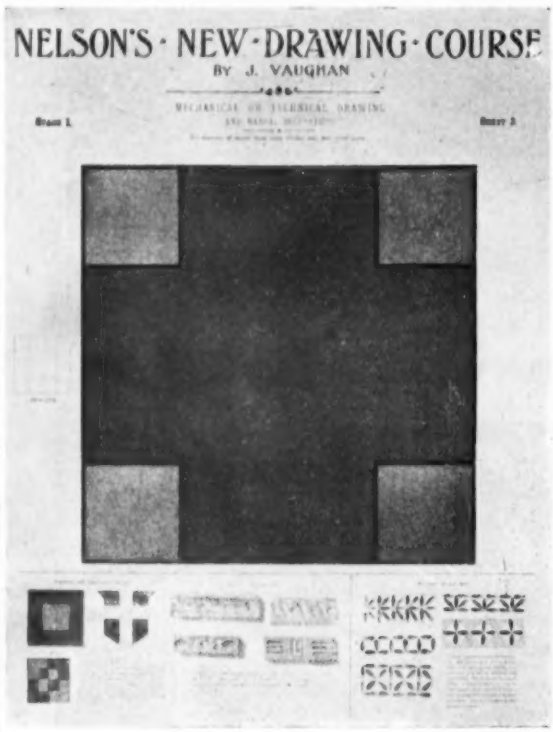
Free-arm Drawing Class at Work.



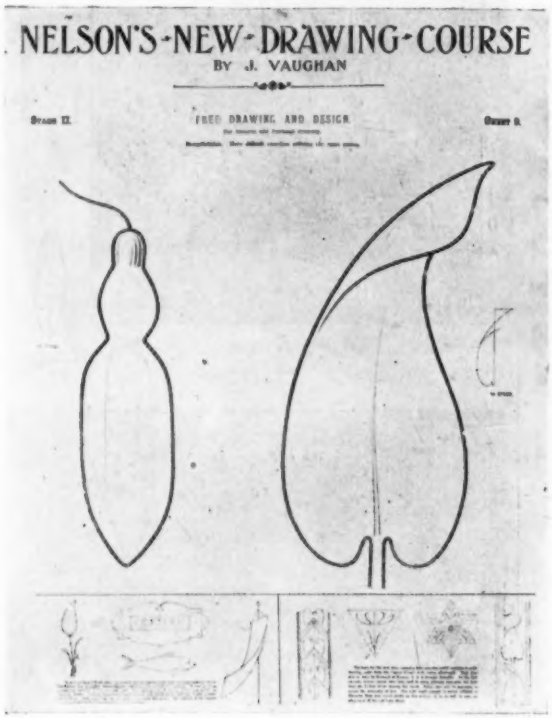
Positions of Hand and Brush in Brush Drawing.

The Teacher's Handbook contains more than 100 explanatory photographs and diagrams, relating to all the different forms of Drawing and Manual Occupations.

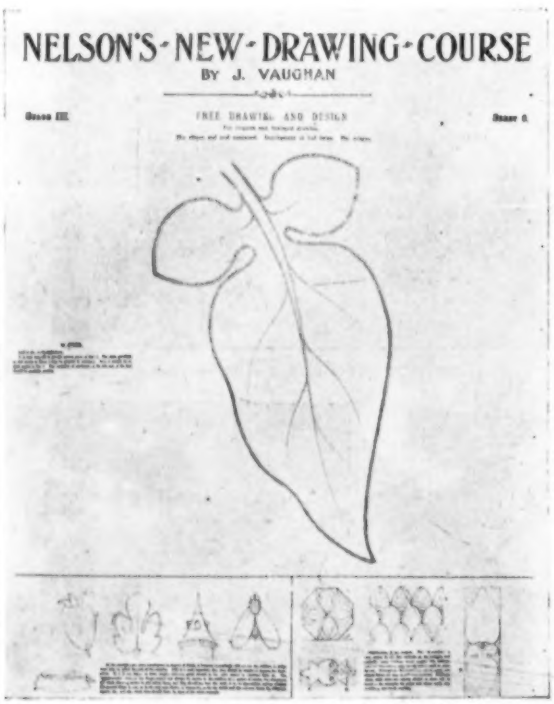
REDUCED SPECIMENS OF LARGE SHEETS FOR CLASS TEACHING.



Set I.—Colour Side.



Set II.—Gray Line Side.

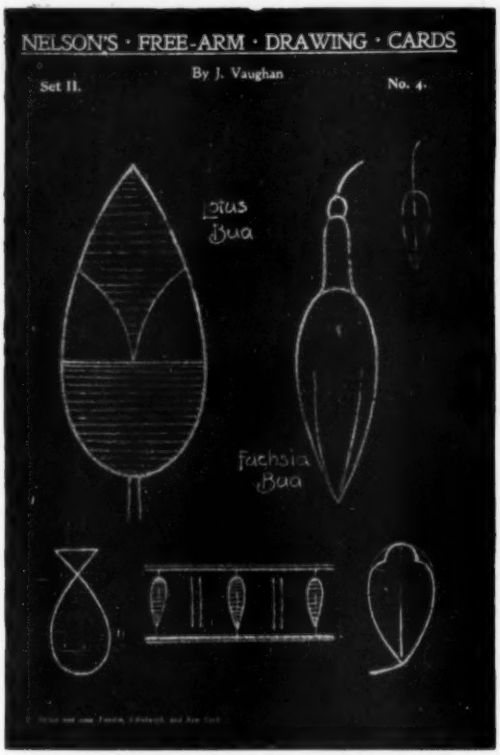


Set III.—Gray Line Side.

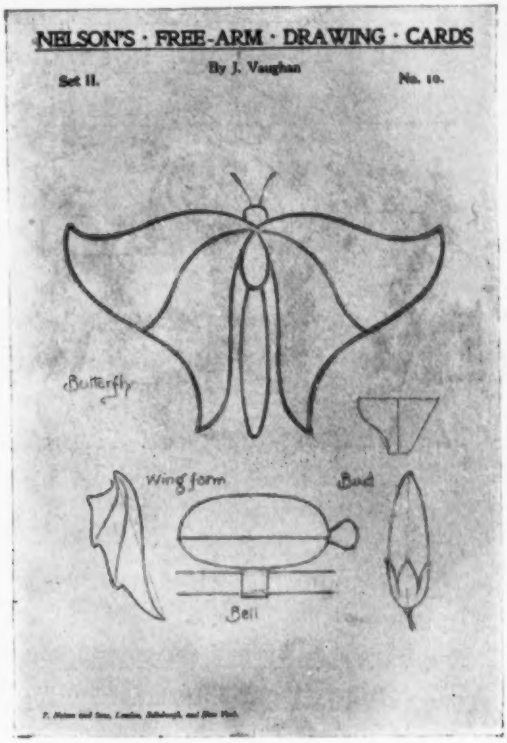
Set III.—Colour Side.

Each set consists of 10 sheets, 20 by 27 inches, printed on the one side in soft gray line, and on the other in harmonious shades of colour. Each sheet provides work for one month in the various branches.

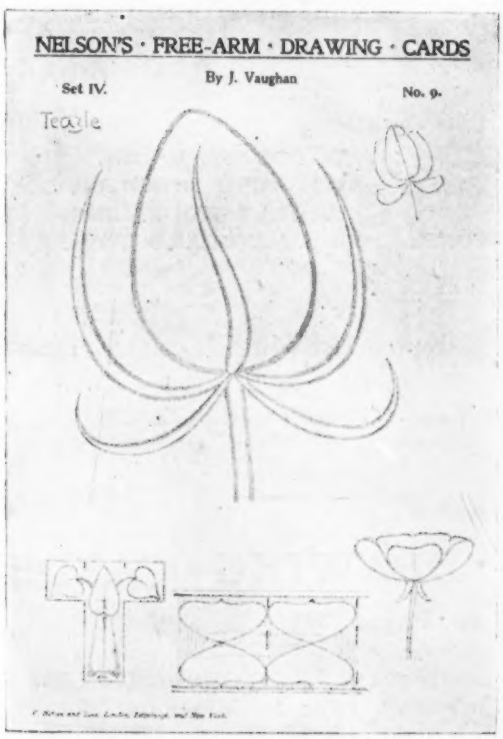
REDUCED SPECIMENS OF FREE-ARM DRAWING CARDS.



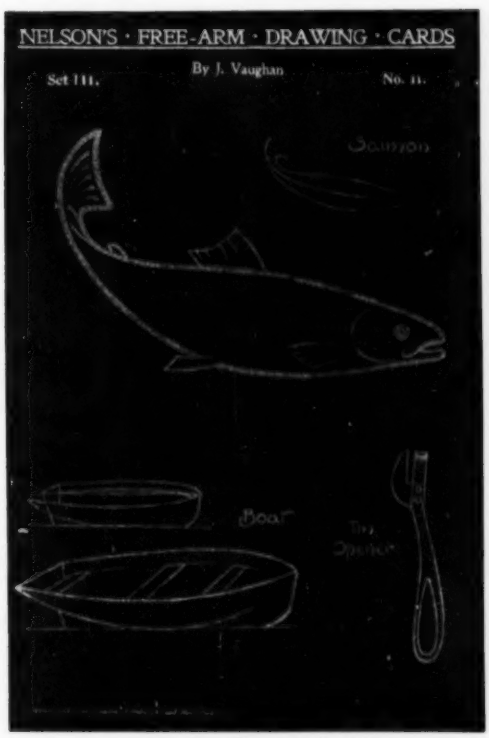
Set II.—White Chalk Line.



Set II.—Pencil or Crayon Line.



Set IV.—Pencil or Crayon Line.



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PRINTED AND PUBLISHED BY THOMAS NELSON & SONS, PROPRIETORS, AT THE OFFICE OF "THE PRACTICAL TEACHER," 35 & 36 PATERNOSTER ROW, LONDON, E.C.